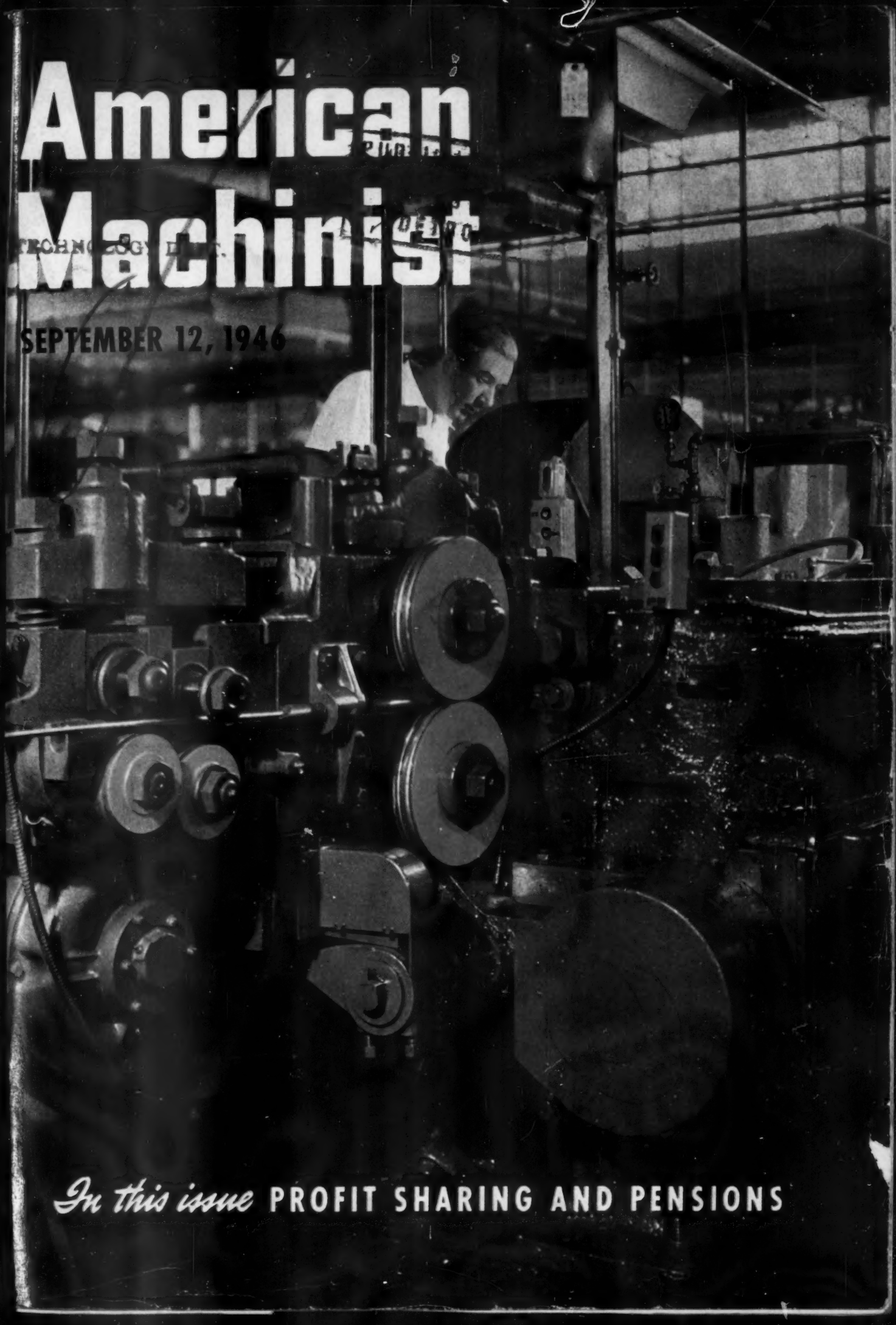
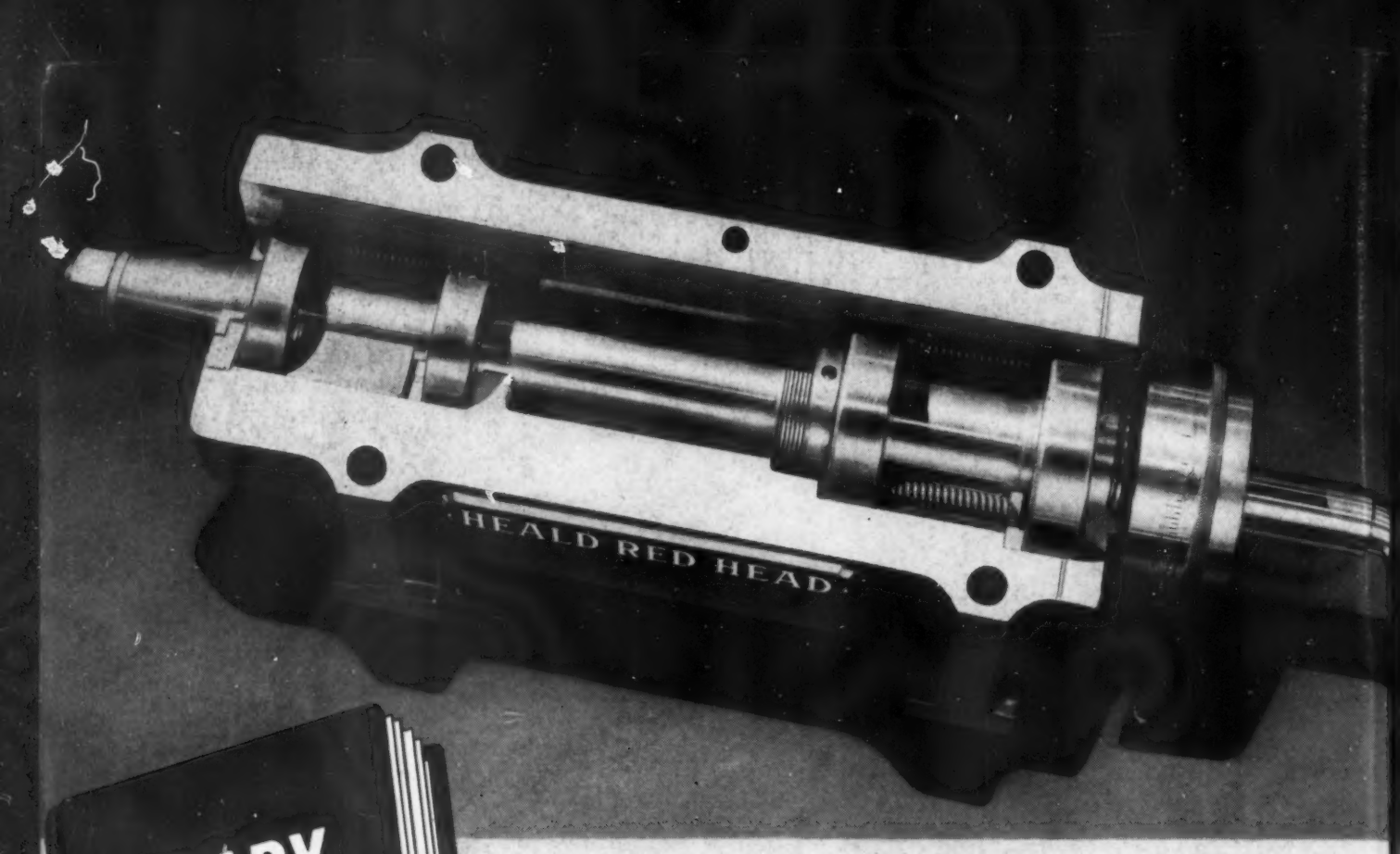
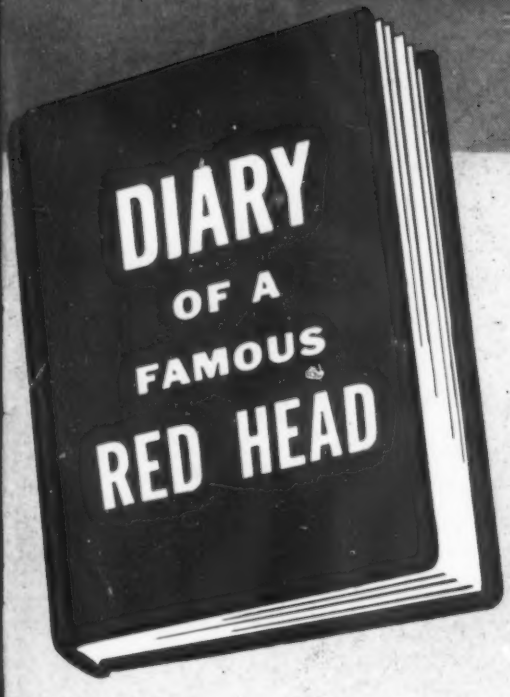

American
Machinist
SEPTEMBER 12, 1946
In this issue PROFIT SHARING AND PENSIONS





BORN

"Red Head" Boringheads and Wheelheads were conceived in the Heald engineering rooms, after many years of experiment by top specialists in machine tool design. The "Red Head" had to be self-adjusting . . . it had to be dependable and foolproof . . . and it had to deliver the very finest in precision finishing. Result: a rugged, serviceable head, soundly constructed and adaptable to every requirement in internal grinding and borizing operations.

VITAL STATISTICS

Cutaway view above illustrates some of the exclusive features of "Red Head" design. Spindle bearings are of the angular contact type, assembled under definite spring preloading which automatically compensates for temperature expansion or contraction and wear. Oil flow to the bearings is regulated by individual felt wicks. Close-fitting baffles exclude dirt and water.

SERVICE RECORDS

The Heald "Red Head" has earned a reputation for doing its job—whether it be high speed operation rotating grinding wheels or tools, or carrying heavy work fixtures—with a minimum of maintenance and with the utmost in precision efficiency. Here are some actual "Red Head" service records from our files:

- **22,000 hours' service—in production 24 hours a day.**
- **6 years' production—no bearing replacements or repairs.**
- **24-hours-a-day production for 3 years maintaining perfect condition.**
- **8⅓ years' operation—36,420 hours' service.**
- **In continuous operation for 10 years—still using the original boringhead bearings.**
- **32 Bore-Matics with over 100 Heads in one plant—only one required bearing change.**
- **45 Bore-Matics in another plant—some in continuous operation for 8 years without boringhead trouble.**

Records like these, common among "Red Head"-equipped Heald machines, result in quicker set-ups, fewer delays, less down time—factors that may well mean the difference between profit and loss in your machining work. Whatever the size of your shop or the scope of your work, chances are that the "Red Head" and the men who designed it can help to give you faster, more economical production. For further information, write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision

. . . less cost

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

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√R v.90⁵ Sept.-Oct. 1946

Chips and Quips

Cover Kodachrome . . . A National coldheader at work on aluminum anchor-nut blanks at Elastic Stop Nut Corp., Union, N. J. The machine cuts blanks from the coil of aluminum wire entering at left, forms and turns them in two automatic steps, then ejects them into tote boxes beneath the feet of Joseph Powers, operator, at the *far* side. A McGraw-Hill Kodachrome.

Profit Sharing . . . There has been much talk since the war of profit-sharing plans in Metalworking; much more is anticipated. As a consequence, Burnham Finney has put together available information on such plans, showing both potentials and pitfalls. He has drawn from many sources to create this special report for Metalworking management. Reprints are available, as usual.

Carbides in Dies . . . The war pushed research in applications of cemented carbides to punches and dies. During the past half-year or more, Associate Editor Ben Brosheer (Chicago) has been collecting the recent experiences of many companies with such dies, showing their advantages and limitations. His data are presented in a roundup report that leads this issue.

Machine-tool Futures . . . Dr. Gosta Truedsson begins in this issue his four-part article on design of machine tools, suggesting the elements that are important to consider . . . We also have a detailed explanation of Westinghouse procedure in new-product development, an explanation of the new Wharton (British) jig and fixture system . . . C. B. Smith gives tooling for the examples of flash-welding he presented in the Aug. 29 issue, and fundamentals on measurement of hobbed gear teeth are presented.

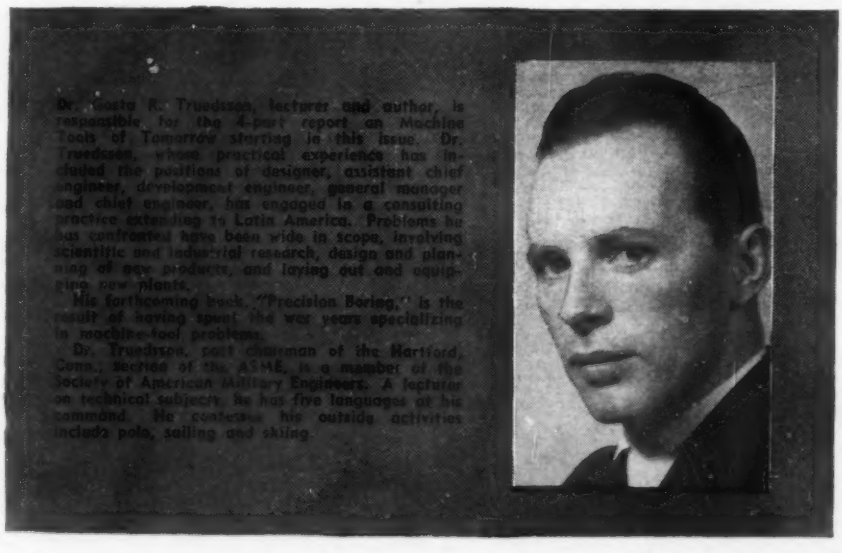
Ford in Print . . . Rupert LeGrand has dug out of Detroit the details of conveyorizing the Ford piston-machining line to save labor and damage, among other advantages. . . . Westinghouse uses a committee to develop and process new designs. The routine is explained. . . . Special techniques have been developed for sawing transparent plastics. W. W. Farr, technical consultant of Rohm & Haas, tells all.

We Bow . . . Readers say about ads: *"I find* American Machinist *of considerable value to me both from the standpoint of machining methods and a means of keeping in contact with the different advertisers who use your magazine to keep their products before the public." D. J. Cahill, M. M., Libbey-Owens-Ford Glass Co., Ottawa, Illinois.*

"Interested always in your advertisements, as well as all news items. Find American Machinist *very valuable for staff—magazine is passed on to various departments." M. J. Witteman, Pres., Witteman Mfg. Co., Alhambra, Calif.*

"Both the dignity and efficiency of your publication, editorials and advertisements are most constructive. I read them regularly." E. K. Ward, Pres., Machinery, Tool & Engineering Corp., Houston, Texas.

Coming . . . Dodge has tricky direct-fired body-baking ovens, with air movement many times that in indirect setups. Associate Editor LeGrand tells about it . . . B. F. Hunter of Honan-Crane describes systems for cleaning coolants . . . There's interesting development in solving corrosion of fine copper wire after soldering . . . We'll also have a description of several types of gas-fired automatic hardening machines and a report from Czechoslovakia giving high spots of applications of cemented carbides at the Skoda Works . . . Among other subjects are boring car wheels, tool chatter, wage incentives, measurement of gear teeth.



Dr. Gosta R. Truedsson, lecturer and author, is responsible for the 4-part report on Machine Tools of Tomorrow starting in this issue. Dr. Truedsson, whose practical experience has included the positions of designer, assistant chief engineer, development engineer, general manager and chief engineer, has engaged in a consulting practice extending to Latin America. Problems he has confronted have been wide in scope, involving scientific and industrial research, design and planning of new products, and laying out and equipping new plants.

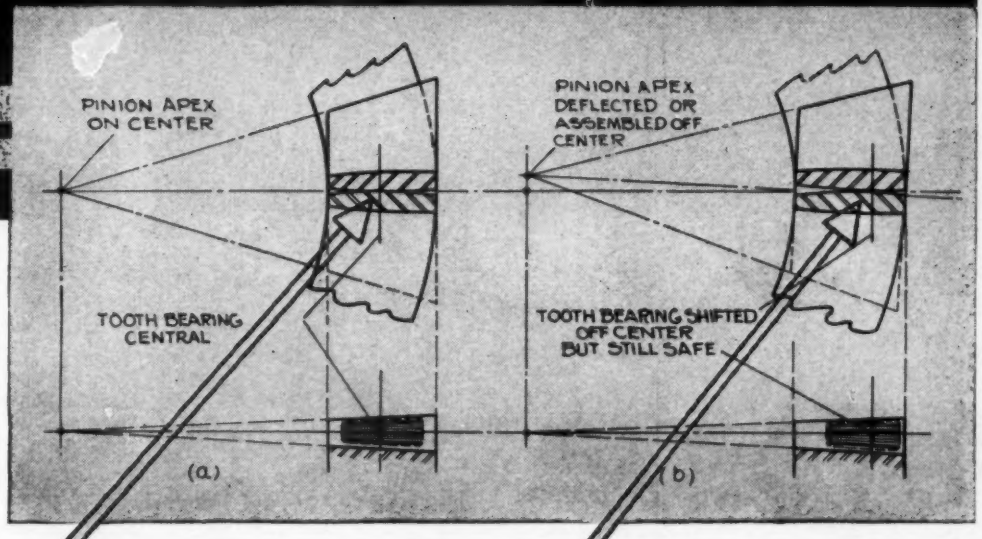
His forthcoming book, "Precision Boring," is the result of having spent the war years specializing in machine-tool problems.

Dr. Truedsson, past chairman of the Hartford, Conn., section of the ASME, is a member of the Society of American Military Engineers. A lecturer on technical subjects, he has five languages at his command. His contrasting outside activities include polo, sailing and skiing.

Tech

CONIFLEX

THE BEVEL GEAR WITH LOCALIZED TOOTH BEARING


PINION APEX ON CENTER
TOOTH BEARING CENTRAL
(a)
PINION APEX DEFLECTED OR ASSEMBLED OFF CENTER
TOOTH BEARING SHIFTED OFF CENTER BUT STILL SAFE
(b)

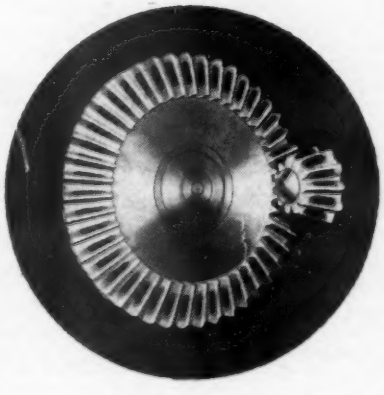
The usual operating position for generated straight bevel gears is here.

Coniflex gears can have the bearing changed here.

— and this can be done without dangerous concentration of load at the ends of the gear teeth.

The latest Gleason Straight Bevel Generators, in the medium and large sizes, have a positive cam-controlled advance of the tool slides at each end of the cutting stroke . . . result: a gear tooth relieved at the ends for:

1. **WIDER OPERATING TOLERANCES**
2. **SMOOTHER QUIETER OPERATION**
3. **EASIER ASSEMBLING**



For informative literature on Coniflex gears write for "Generated Straight Bevel Gears."

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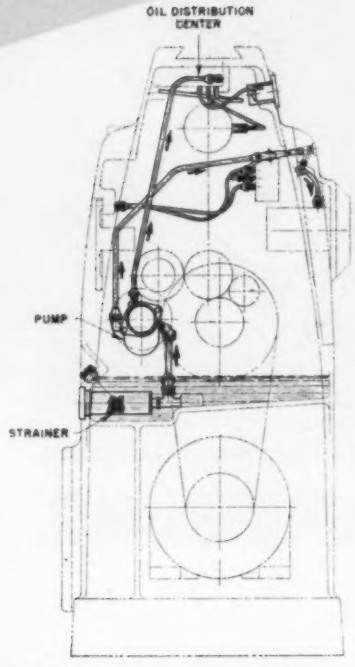
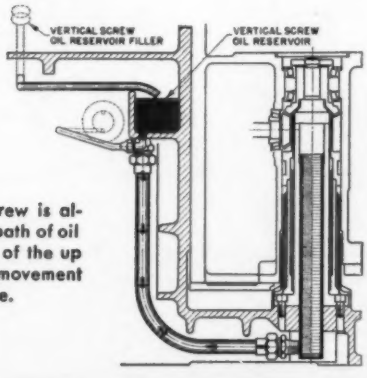
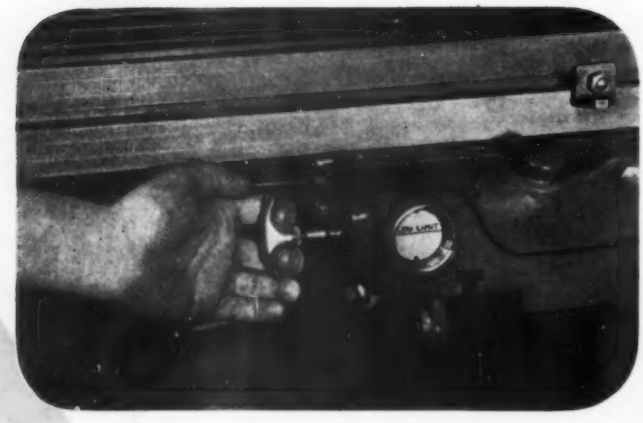
Long Life, *YES*... and ACCURACY throughout the years



Gears and bearings don't wear because of automatic lubrication of all parts within the column. And it's no trouble for the operator to clean the oil strainer.



Vertical screw is always in a bath of oil regardless of the up and down movement of the knee.



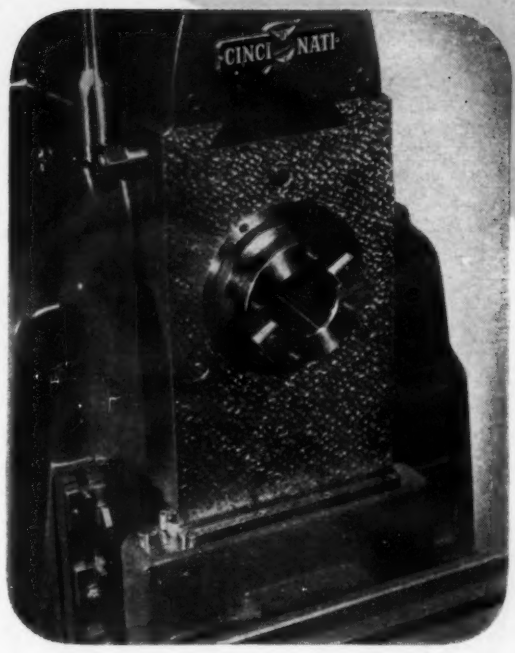
Above: All saddle parts and the table ways are lubricated with a few strokes of the conveniently located plunger. Right: Top side of saddle shows arrangement of lubricating lines.

CINCINNATI

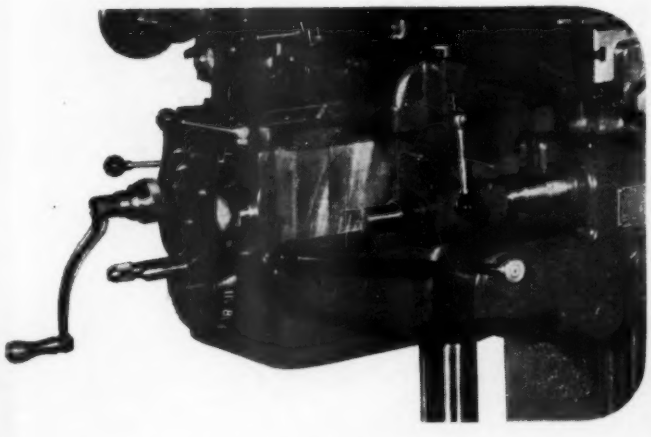
THE CINCINNATI

MILLING MACHINES

● The useful life of a machine tool has always been a much discussed question. Admittedly, it does extend over a number of years, but during the machine's entire life span it should maintain productivity of *accurate* work. ¶On these pages are illustrated a few of the features that retain built-in accuracy for many years in the new CINCINNATI No. 2 MI Milling Machines. They are important, not as features alone, but in getting the greatest value for your machine tool investment. ¶Check over the machine tools in your shop. After three, five, seven, or even ten years, are they still turning out work as accurately as they did the first year? Probably not, and that's why you should consider replacing your No. 2 millers with new CINCINNATI No. 2 MI's. We'll be glad to give you complete information. Write for catalog M-1506. The CINCINNATI No. 2 MI Milling Machines are available in Plain, Universal and Vertical styles.



The heavy apron extension helps keep the knee in perfect alignment with the column. A wiper is built into the top of the apron to keep clean the hand-scraped bearing surface of the column.



Dust and dirt are kept away from the cross feed screw by sliding covers on the side of the knee.

CINCINNATI No. 2 MI Plain Milling Machine. Catalog M-1506 contains complete information. Brief specifications will be found in Sweet's Catalog File.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

Etienne

you wouldn't

Nor would you put carbide cutting tools on a lathe that cannot transmit the power to use them at their maximum efficiency. Carbide cutting tools have increased horsepower requirements as much as 300 per cent. They have increased cutting speeds 200 to 500 per cent.

The chances are that turning accounts for 25 per cent or more of all machining time in your plant.

There are cases in our files of savings of hundreds of dollars a month in the manufacture of a single part by the use of Jones & Lamson machines. Our Turret Lathes and Fay Automatic Lathes are designed specifically for the most efficient use of carbide tools.

Be skeptical of the production efficiency of all metal turning equipment in your plant.

Telephone or write for a Jones & Lamson engineer who will be glad to consult with you on all phases of your metal turning problems.

What HORSEPOWER Are You Using?

15 horsepower is required to take this 1/8" depth of cut on steel forging at 1000 RPM and .022" feed, with a carbide cutting tool, but carbide halves the cutting time.

Turret Lathes

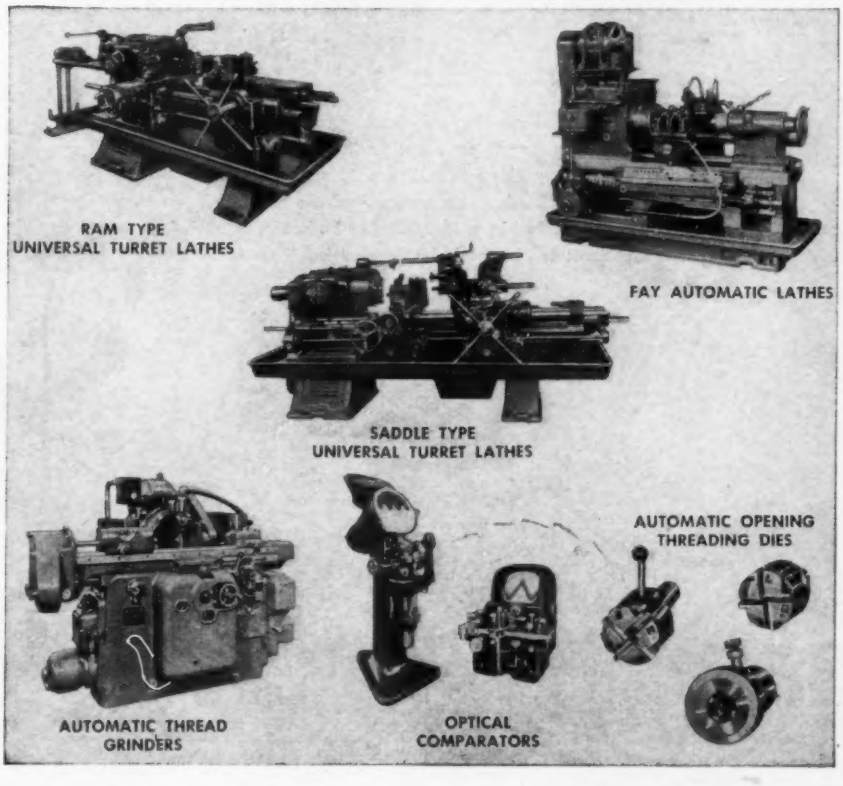
JONES & LAMSON

MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies.

Engineered to "Carry the Load" for Most Productive Operation With Carbide Cutting Tools



You can pin your faith to

INVOLUTE INSPECTION

is made easy on Fellows Involute Measuring Instruments. These Instruments operate on a basic principle, and can be accurately and quickly set for different base diameters by standard size blocks. The accuracy of the involute profile can be checked by a 1/10,000 dial indicator; or a permanent chart can be made by an Electrical Recorder.

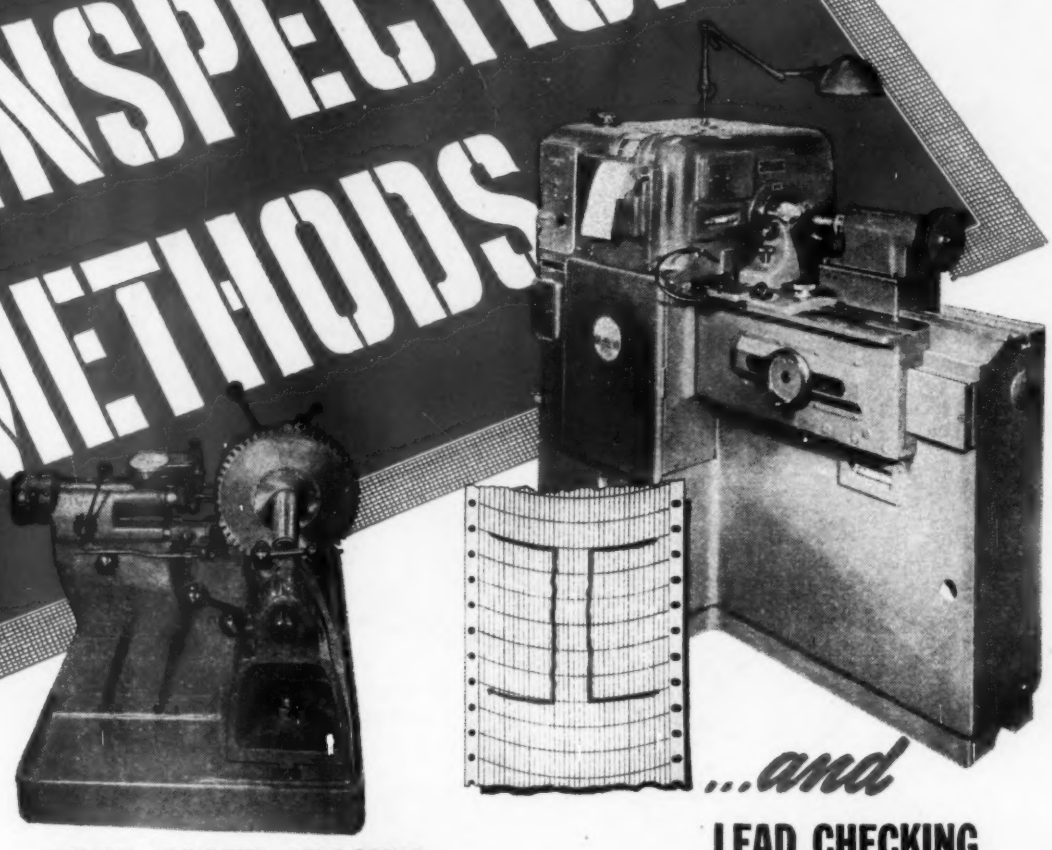
"RED LINER" INSPECTION

These Instruments check gear errors in combination and in a manner closely approaching that of actual operation. As a final check of gear accuracy, these instruments are in a class by themselves. While accumulated errors are presented in a single charted line, individual errors can be identified and their nature, location and magnitude easily measured. The RED LINER is the Keystone of comprehensive gear inspection.

● **GOVERNMENT SURPLUS MACHINE TOOLS:** We are licensed under the WAR ASSETS ADMINISTRATION to act as dealers in the disposal of Government Surplus Machinery. Those interested in obtaining such machinery should contact our Main Office, Springfield, Vt.; or our offices in Detroit, Mich., and Chicago, Ill.

THE FELLOWS METHOD... MACHINES AND TOOLS FOR

INSPECTION METHODS



...and

CONE, TOOTH SPACING AND TAPER

For checking individual elements such as cone, tooth spacing and taper, Fellows makes two instruments for bench use. These are provided with interchangeable heads, and are made in two base types. One instrument is adapted to the checking of cone and tooth spacing, and the other is arranged to check tooth taper in addition to cone and tooth spacing. Instruments are provided with a semi-automatic indexing mechanism for convenience in checking.

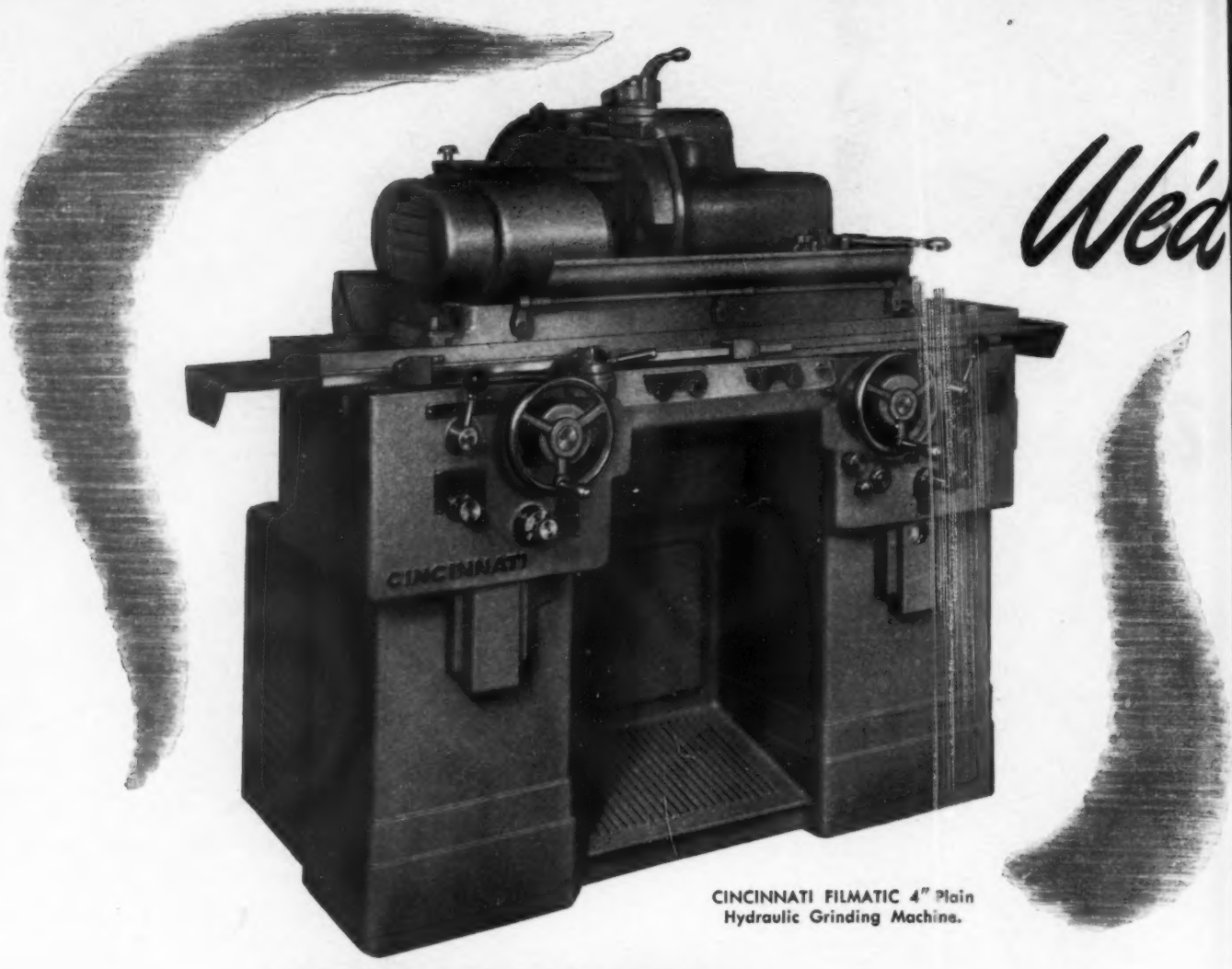
LEAD CHECKING

A recent Fellows development that rounds out a complete inspection procedure. This instrument, known as the No. 12H Fellows Lead Measuring Instrument, provides both visual reading by a 1/10,000 dial indicator, and Electrical Recording. It is adapted to checking the lead of helical gears and crowning and taper of helical and spur gears without the use of any involved calculations. Descriptive circulars on this complete Fellows Inspection procedure are available upon request.

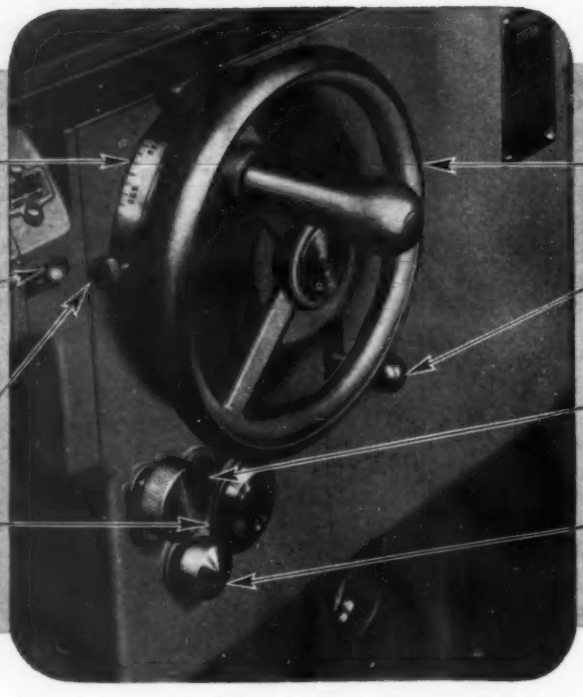
Fellows

The Fellows Gear Shaper Company, Springfield, Vermont
— or 616 Fisher Bldg., Detroit, Michigan
— or 640 West Town Office Bldg., Chicago, Illinois.

ALL OPERATIONS FROM BLANK TO FINISHED GEAR



CINCINNATI FILMATIC 4" Plain
Hydraulic Grinding Machine.



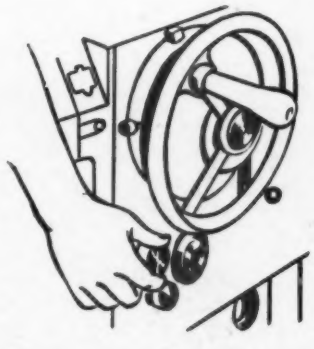
CINCINNATI

CINCINNATI

CENTER TYPE GRINDING MACHINES

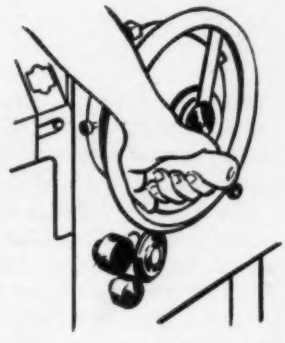
like to PUT ACROSS to you— this CROSS FEED *arrangement*

Every grinding man knows that many factors contribute to the accuracy of a grinding machine. But he also knows that the one deserving top billing is the cross feed mechanism because there are so many elements involved—power transmission parts; the coarse and fine adjustment of the handwheel; the pick feed; the bearing between the bed and wheelhead; and the positive stop for sizing. ¶In the CINCINNATI FILMATIC 4" Plain Hydraulic Grinder, all these elements are made as accurately as men, machines and methods can produce them. And in addition, the design of this unit offers unusual convenience, ease of operation and setup. ¶Take a look at the features illustrated below and then ask yourself if they would speed up production of your small, precision ground parts within the range of the machine. And remember, too, that the new 4" Grinder is equipped with FILMATIC bearings. ¶Complete engineering specifications on this precision, small part production grinder may be obtained by writing for catalog G-520.



Selecting the rate of metal removal per pass is as easy as tuning in a radio. Rate is indicated on an easily read pick feed dial.

To start the pick feed cycle, merely bump the conveniently located pick feed starting button with the palm or heel of the hand. It's as easy as that.



Correction for wheel wear. Adjusting handwheel from one notch to the next (on dial behind handwheel) reduces the work diameter .0001".

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

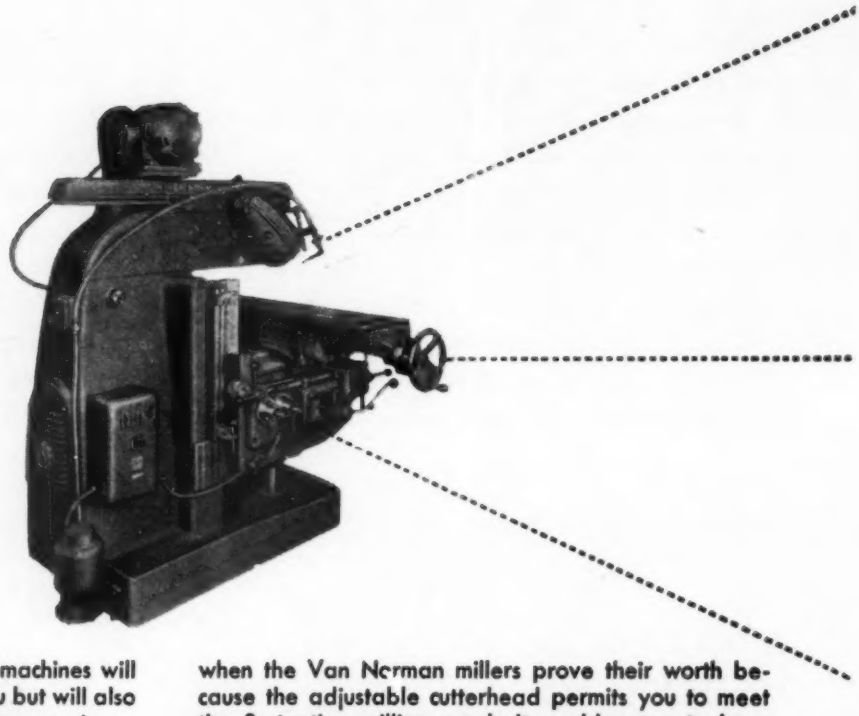
CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Van Norman

RAM-TYPE

Milling Machines

Give Your Operators Every Advantage in Tool Room and General Purpose Milling



The new Van Norman Ram-Type milling machines will not only do your present war work for you but will also *fit into your production scheme when you reconvert.*

Whether you need one or a dozen, each of these versatile millers gives you the working capacity of three machines. The adjustable cutterhead enables your operator to do vertical, horizontal or angular milling. This means that work re-setups are minimized since most jobs can be carried through completion in the original setup.

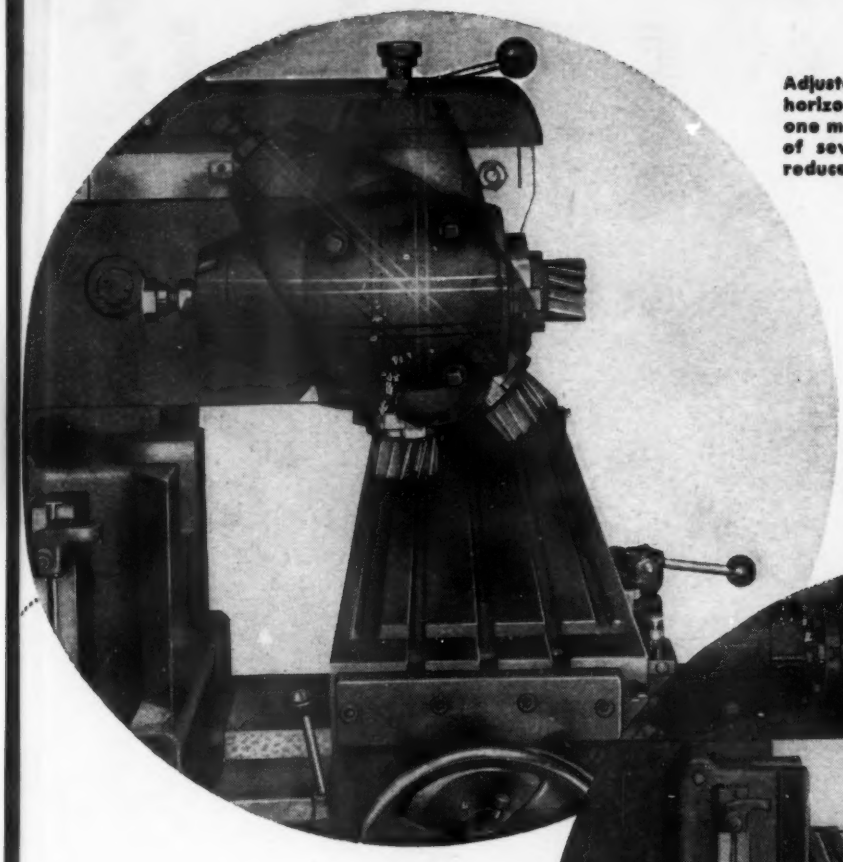
If most of your work is general purpose milling, then each day brings various types of milling work. One period mostly horizontal, another vertical, etc. This is when the Van Norman millers prove their worth because the adjustable cutterhead permits you to meet the fluctuating milling needs. It enables you to keep them operating continuously, saving you money by eliminating idle machine time so often encountered with single purpose machines.

In addition, such advantages as front and rear control of both manual and power feeds, directional control of all power feeds, single lever feed selector, sturdy column, base, table and knee assembly assure simplicity of operation, accuracy, and reduce rejects. Van Norman Ram-Type millers are available with plain or swivelling tables. Write for information.

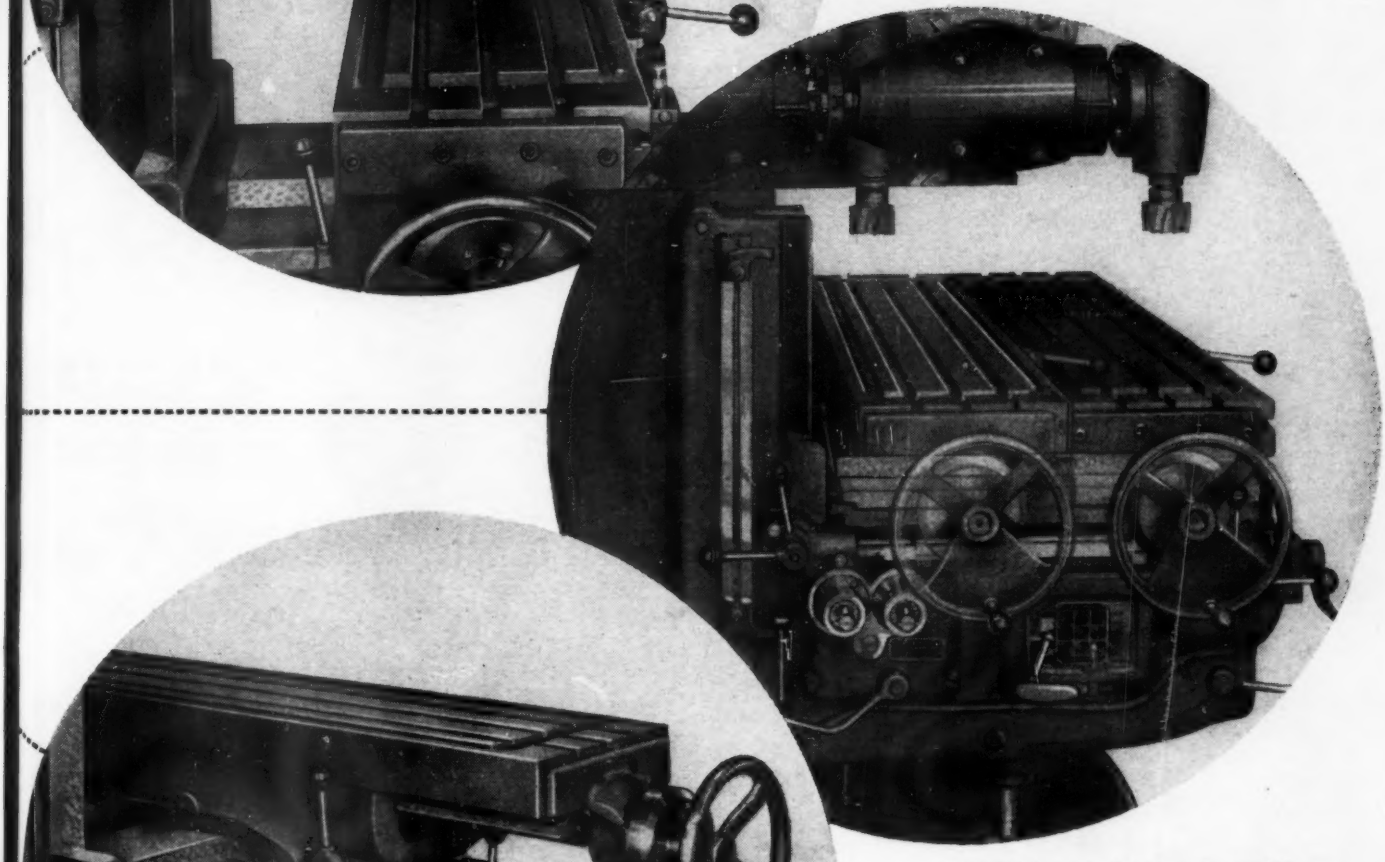
VAN NORMAN COMPANY

Springfield 7, Massachusetts

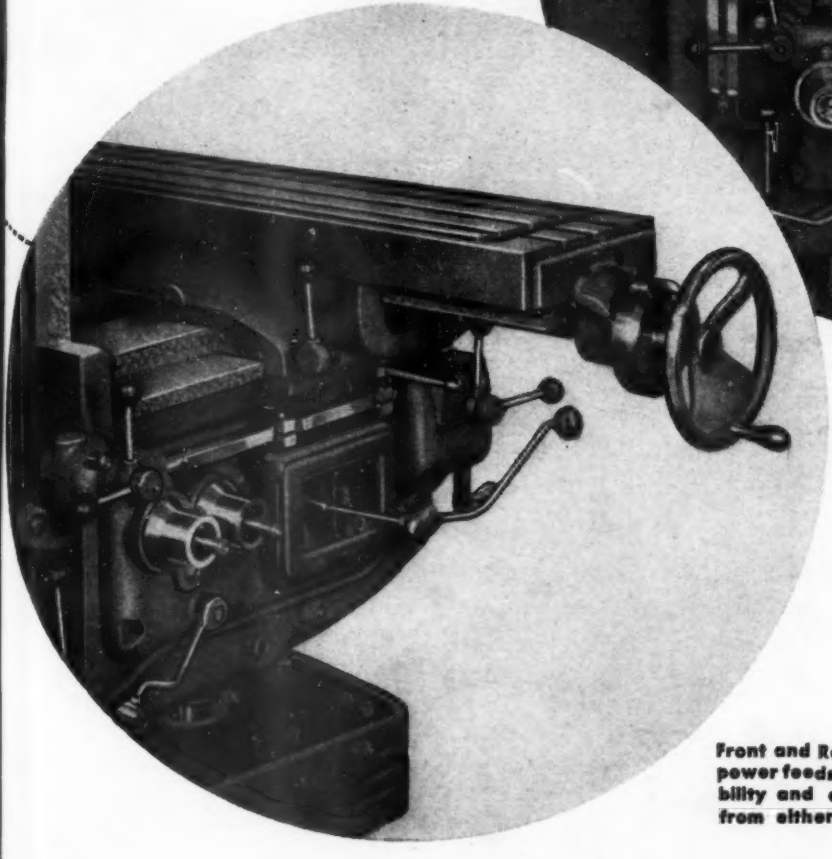
"It pays to Van Normanize"



Adjustable cutterhead permits vertical... horizontal . . . or angular milling all on one machine—gives you the work range of several types of millers . . . greatly reduces work reset-ups.



Adjustable cutterhead and movable ram, in combination with the saddle cross feed, provides maximum milling capacity and versatility.



Front and Rear control of both hand and power feeds gives operator complete visibility and control of milling operations from either location.

LANDIS

LANDMACO THREADING MACHINE

The LANDIS LINE

THREAD CUTTING MACHINES
- Landmaco Threading Machines
- Bolt Factory Threaders
- Automatic Forming and Threading Machines
- 4 Spindle Semi-Automatic Threading Machines
- Pipe and Nipple Threading Machines

THREAD CUTTING DIE HEADS
- Landmatic (for Turret Lathes and Screw Machines)
- Landex (for Automatic Screw Machines)
- Lanco (for Automatic, Semi-Automatic and Hand-Operated Threading Machines)
- Lanco Pipe and Nipple Threading Heads
- Stationary Pipe Die Heads
- Reverse Taper Die Heads
- Standard Rotary Die Heads

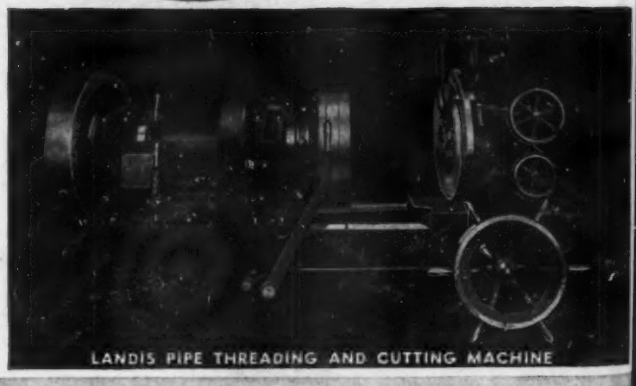
PRECISION THREAD GRINDERS

PIPE THREADING AND CUTTING MACHINES

ROLLER PIPE CUTTERS

CHASER GRINDERS

COLLAPSIBLE AND ADJUSTABLE TAPS



LANDIS PIPE THREADING AND CUTTING MACHINE

LANDIS

Production Line

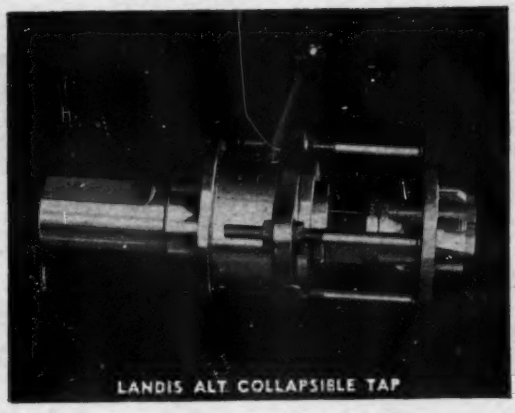
THE LANDIS CHASER

Automobiles, Radios, Washing Machines . . . present different Threading requirements for 1946.

Regardless of your Threading needs, Landis Equipment will handle them efficiently and economically—Landis Engineers will tell you how!

Individual Bulletins covering the various Threading Equipment in the "Landis Line" are available. Write us for any in which you are interested.

THE LANDMATIC HEAD



LANDIS ALT COLLAPSIBLE TAP

THE LANCO HEAD

AUTOMATIC FORMING & THREADING MACHINE

LANDIS ½" THREADING MACHINE

LITTLE LANDIS THREADING MACHINE

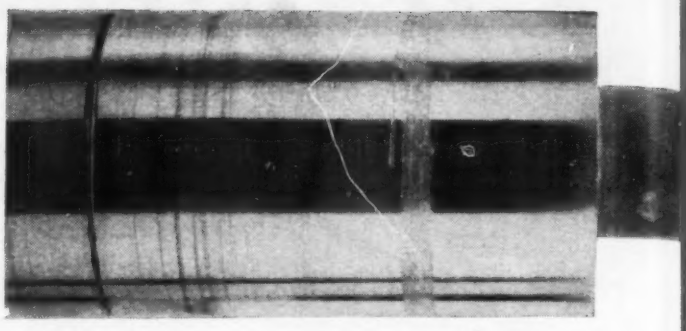
LANDIS MACHINE COMPANY

WAYNESBORO · PENNA · U·S·A·

How SURFACE DEFECTS

. . . impair bearing operation

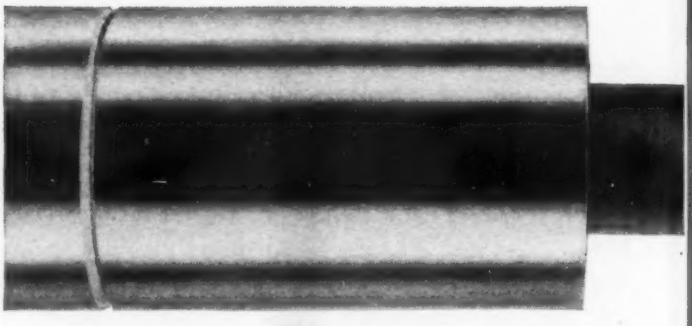
No matter how smooth a ground surface may appear, examination will reveal imperfections in the form of grinder scratches and ridges, feed spirals, chatter marks and partially loosened metal splinters. Upon contact, these minute peaks and ripples interlock with the mating surface of the bearing, tending to rupture the protective oil film. Fragmented metal is torn from surfaces to mix with lubricant and cause abrasive wear, increasing clearance dimensions and shortening life. Photo at right shows an example of a scratched and galled surface which stopped rotation by "plowing" metal.



How SUPERFINISH

. . . insures bearing life

Superfinish removes all surface defects such as grit scratches, feed spirals and the soft "smear metal" caused by grinding heat, and having removed the faulty layer—gets down to metal of the desired structure and hardness. At the same time it produces a more nearly perfect geometrical form which supports a more efficient oil film for lubrication. There are no projecting defects to churn the oil film or cause metallic contact. Load carrying capacity is substantially increased by Superfinishing. And bearing life is almost unlimited.



SUPERFINISHING

. . . a quick and inexpensive process

The Superfinishing process is done with a bonded abrasive conforming to the radius of the part being finished. Gently oscillated as the part is rotated, it performs a mild scrubbing action which removes surface imperfections in a matter of seconds. And, in many cases, it eliminates more expensive operations such as hand lapping.

The Gisholt General Purpose Superfinisher at right is a self-contained unit, ideally suited for a wide range of miscellaneous or production work. Ask for complete information.

●

GISHOLT MACHINE COMPANY

1201 East Washington Avenue • Madison 3, Wis.

Look Ahead • Keep Ahead • with Gisholt

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

For Speedy Precison Production

Canedy-Otto

8 SPEED MOTOR SPINDLE RADIAL DRILL

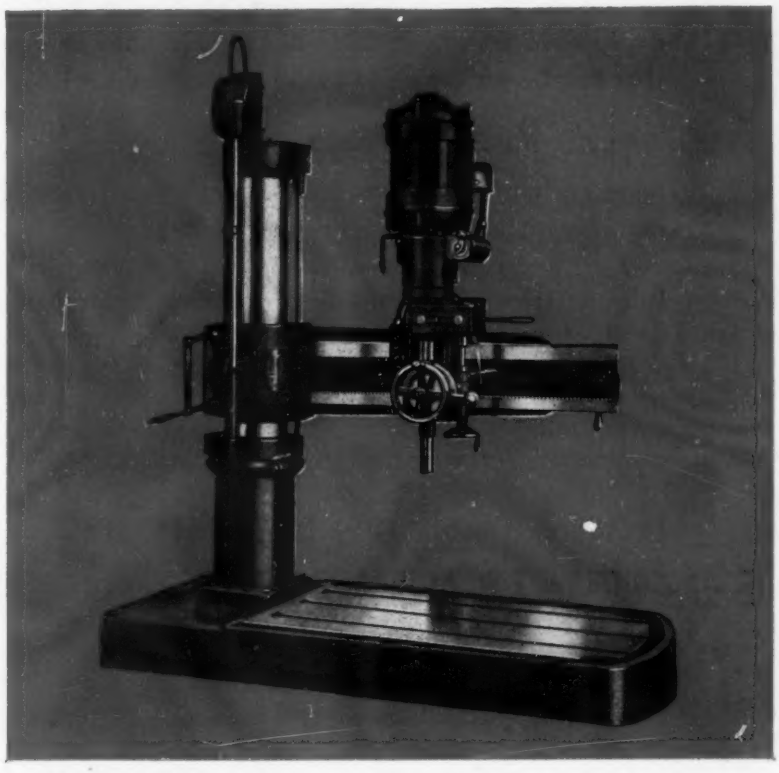
MANY EXCLUSIVE FEATURES

This new CANEDY-OTTO Radial Drill provides all the best features of many larger, more expensive radial drills, plus many exclusive features of its own.

It is powered by a 2-HP constant horse power, ball bearing mounted motor of 4-speed type, providing 8 spindle speeds; Three-button station provides instantaneous forward or reverse direction changes without going through the "stop" button for tapping; it has four rates of power feeds, changeable while machine is in operation; Large graduated dial and automatic trip provide for speed and accuracy in predetermined depth drilling.

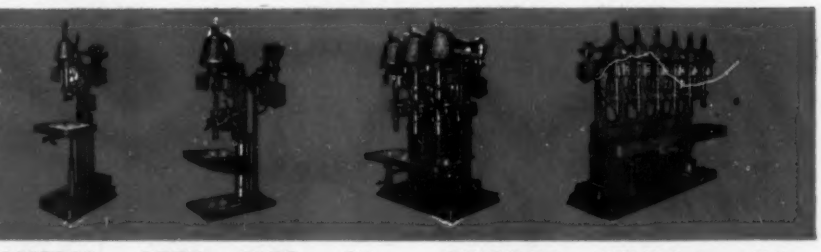
Column and arm rotate on annular ball bearings and Timken bearings. Vertical movement of the arm on the column is controlled by a 2-way drum switch and motor. Saddle head rides on ball bearings, but clamps on hardened jib, to relieve bearings of load. The base is heavily ribbed, provided with T-slots and coolant tank. Unit is available in 3 ft., 4 ft., and 5 ft. arm models.

Write for detailed specifications.



CANEDY-OTTO engineers *specialize* in the design and production of drill presses. We build nothing else. But we do offer the world's most complete drill press line — a faster, more productive, more economical drill press for every drilling need. See us first for your drill press requirements. And when you have a special drilling problem, let a CANEDY-OTTO engineer — a drill press specialist — help you solve it.

BUILDERS OF A COMPLETE DRILL PRESS LINE



CANEDY - OTTO MFG. CO. — CHICAGO HEIGHTS, ILL.

DETROIT PUBLIC LIBRARY

A MIRROR FINISH

Ground to surface finish of under 1 micro inch

• The mirror finish of under a micro inch produced on this roll is typical of the fine finishes that can be produced on standard Landis Tool Hydraulic Universal Grinders.

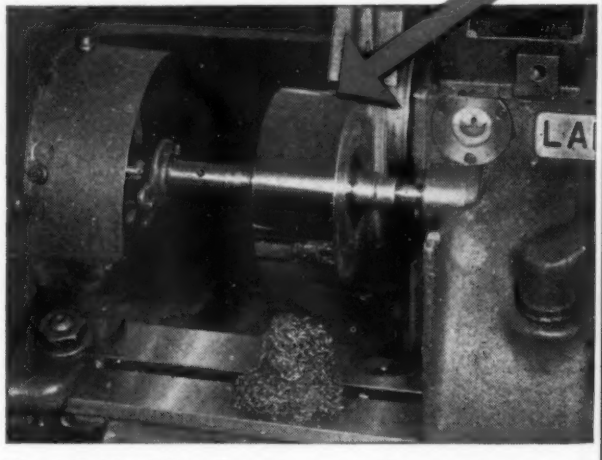
The results come from a combination of design features, many of them exclusive, plus craftsmanship of the highest order in manufacture and assembly. Finally all machines are given full operating tests before shipment. Here are what some of the exclusive Landis Tool features mean in grinding results: Double cylinder hydraulic table traverse assures smooth traverse and reversal; microsphere wheel spindle bearings require less than usual clearance and can be compensated for wear; dynamic balance of rotating parts assures freedom from vibration; variable voltage headstock drive gives stepless speed adjustment from 55 to 495 rpm.

The universal features of this grinder make it ideal for tool room work. The hydraulic features speed production because the hydraulic automatic wheel feed and hydraulic table traverse can be adjusted readily to the combination best suited to the job.

For detailed information on the 10" x 24" type CH Hydraulic Universal Grinder ask for Landis Tool Catalog I45. 51

EXCLUSIVE LANDIS TOOL DESIGN FEATURES CONTRIBUTE TO ACCURACY AND FINE FINISH!

- **Variable Voltage Headstock Drive**
- **Microsphere Wheel Spindle Bearings**
- **Double Cylinder Hydraulic Table Traverse**
- **Dynamically Balanced Rotating Parts**



Mirror finish of less than a micro inch ground on a steel roll with 10" by 24" Type CH Hydraulic Universal.

LANDIS TOOL
Precision Grinders

LANDIS TOOL COMPANY

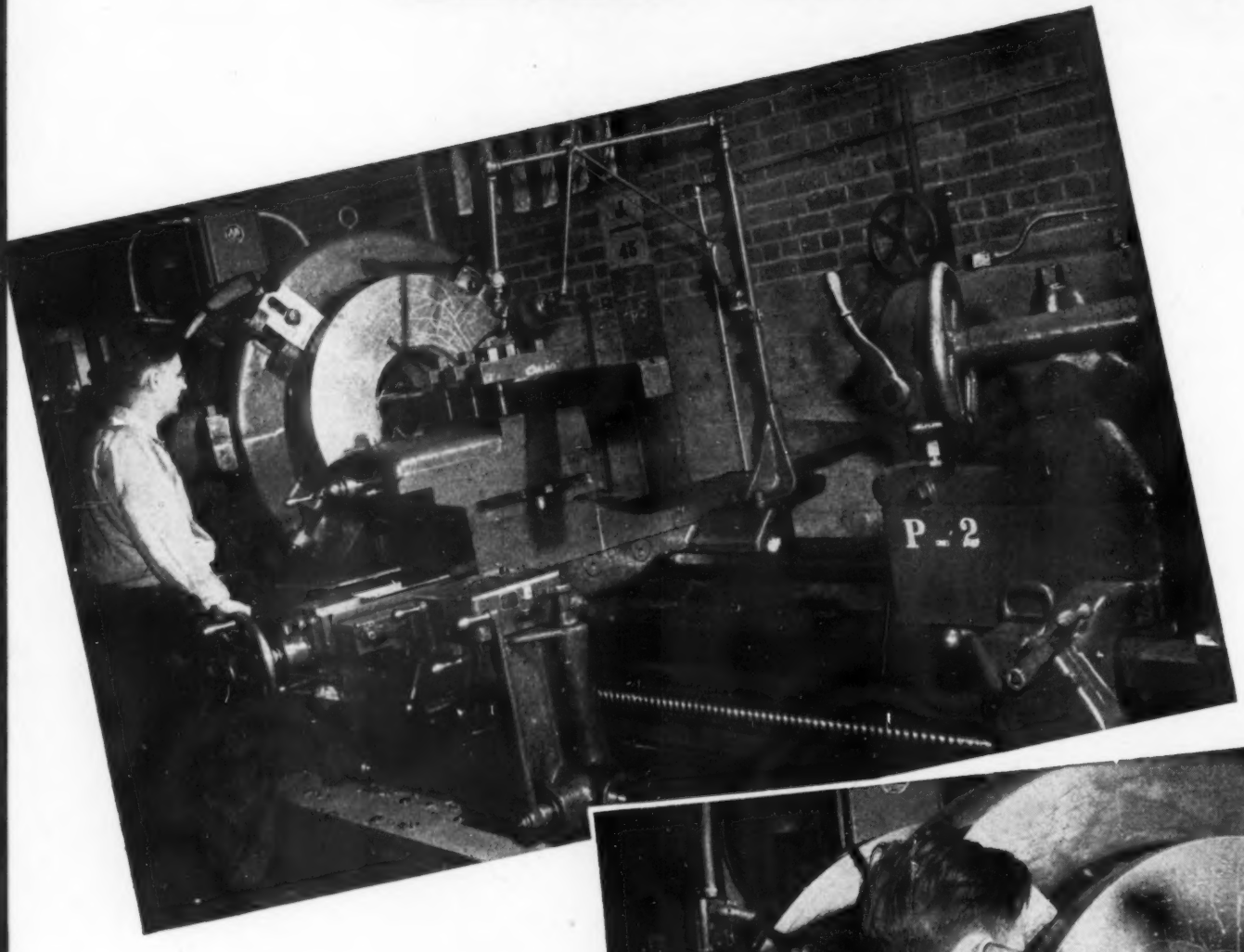
Smoother than Glass

10" x 24" TYPE CH HYDRAULIC UNIVERSAL GRINDER—Fully universal headstock. Swiveling wheelbase. Standard equipment includes: ball bearing type internal fixture; chuck for internal and face grinding; automatic hydraulic wheel feed.

LANDIS TOOL *Company*

WAYNESBORO, PENNA.

Like all True A



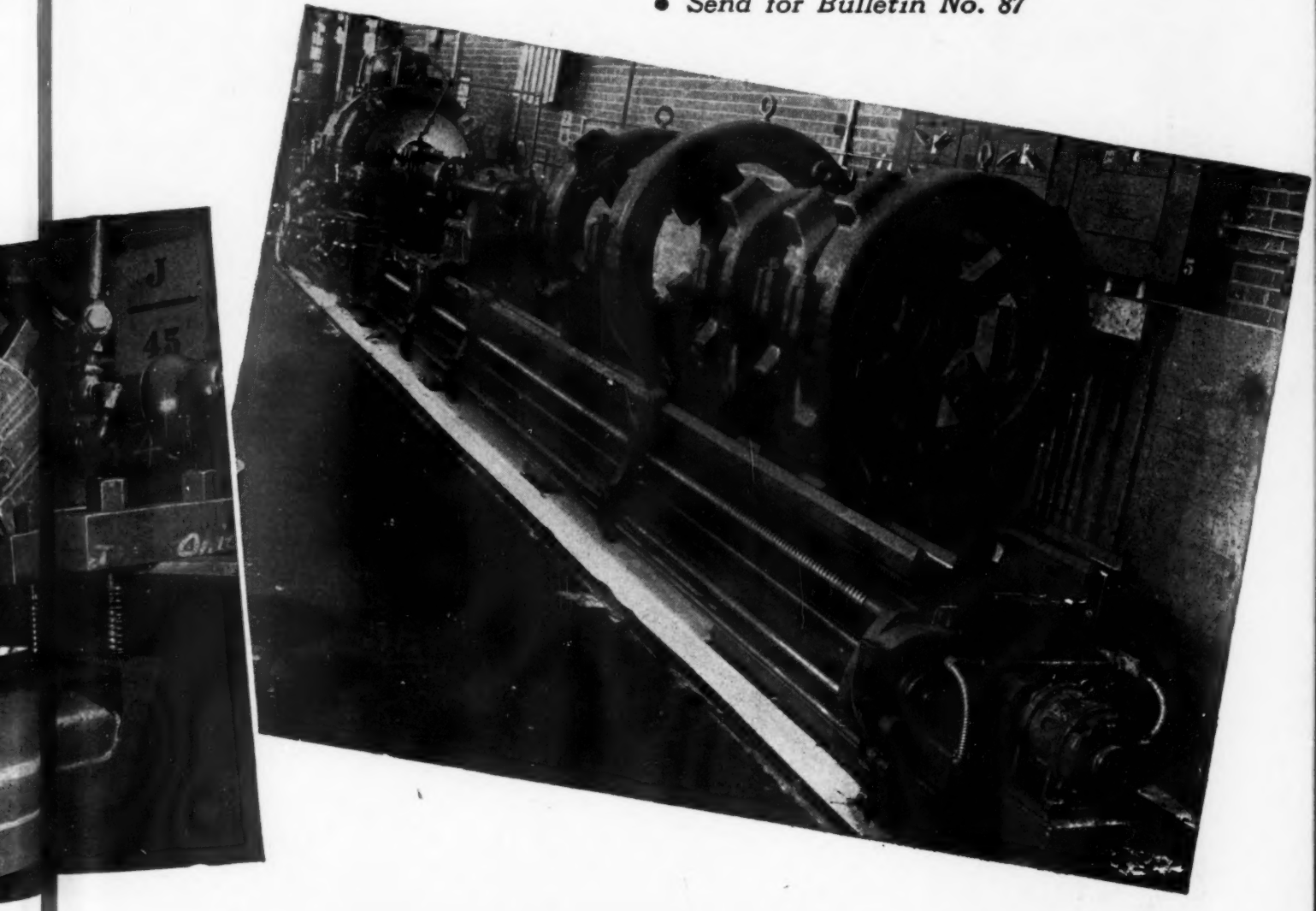
THE AMERICAN TOOL WORKS CO

AMERICANS...

"AMERICAN" Lathes, from the smallest to the largest, are meeting the challenge of production like all true Americans. The power, stamina and endurance built into "American" Lathes have proven invaluable to many a production plant operating on an around-the-clock schedule. Dependable service, minimum shut-down for failures and repairs coupled with an almost unbelievable ability to "keep going" under any and all conditions are genuine "American" characteristics. "American" Lathes are easy to operate, too—another feature that appeals to the operator as do their simplicity of design and complete freedom from complex mechanisms and manipulations.

"American" Lathes are an asset in any plant.

• *Send for Bulletin No. 87*



Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

To Put PRECISION
into your Big Jobs . . .
NORTON
SERIAL NO.
MADE IN U.S.A.

NORTON 14" and 16" GRINDERS

LARGE shafts, machine spindles, boring bars, railway car axles, large crankshafts — if you are grinding parts like these you'll be interested in the Norton 14" or 16" Type C's.

Their massive, abundantly powered wheel unit, their large, powerful work supporting units and their heavy, stiffly ribbed base make them ideal for grinding large work to high precision and a beautiful finish.

All controls are closely grouped in front of the operator for easy operation.

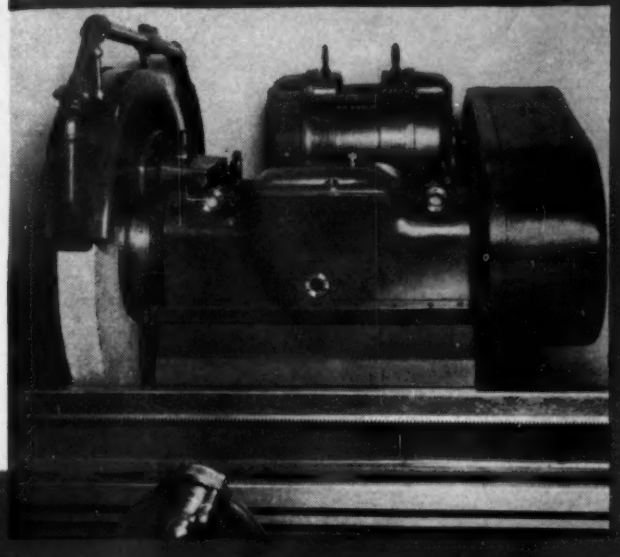
Their dependable and proven Norton design means economical upkeep.

Available in seven standard lengths — 36", 48", 72", 96", 120", 144", 168". Catalog 99 gives complete details about Norton 14" and 16" Type C Grinders — write for a copy.

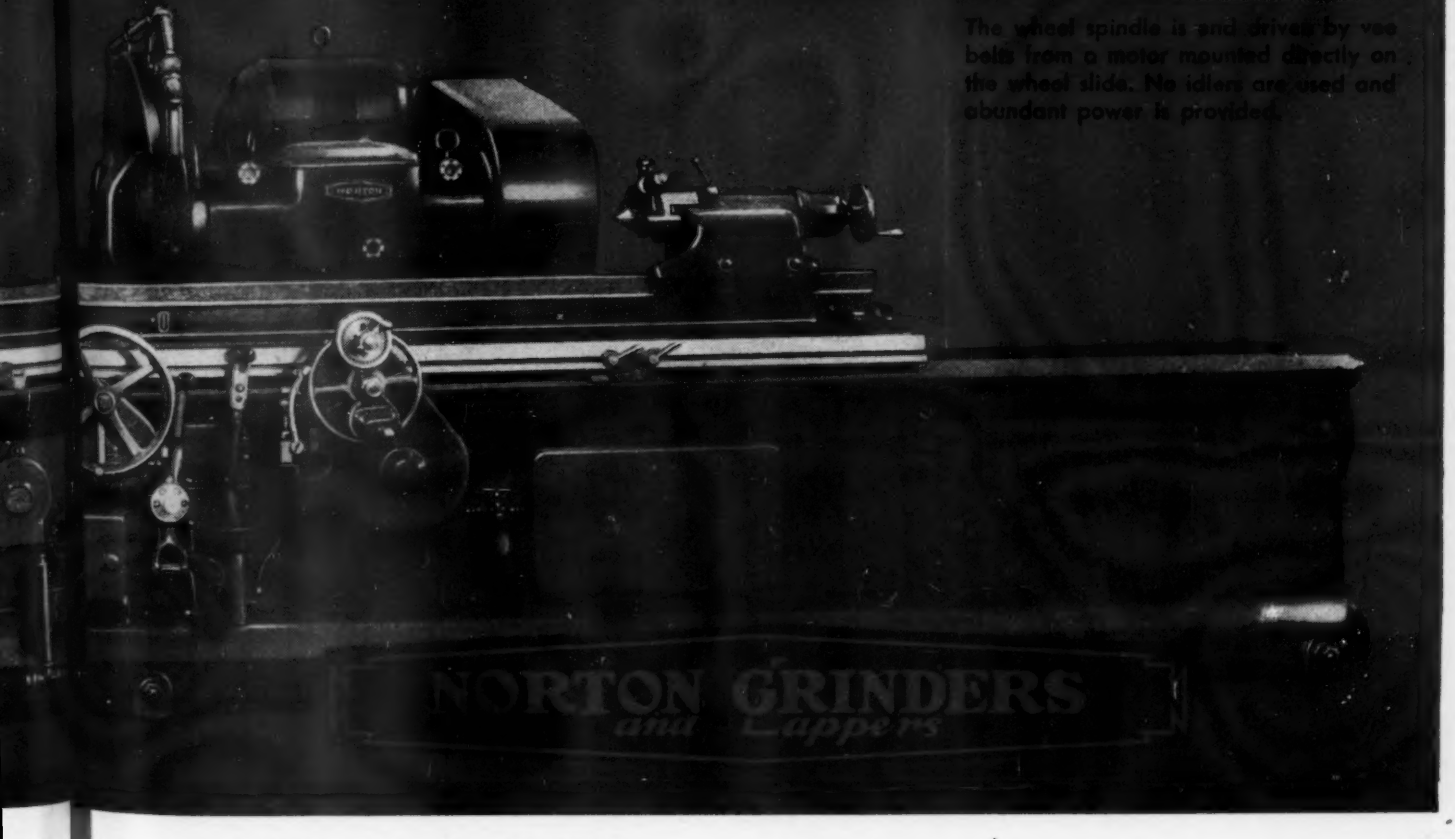
NORTON COMPANY, WORCESTER 6, MASS.

Distributors in All Principal Cities.

M-527



The wheel spindle is and drives by vee belts from a motor mounted directly on the wheel slide. No idlers are used and abundant power is provided.



. . . then let MORSE recommend the One Drill that will Live Longest on Your job

MORSE recommendations for cutting tools have back of them a long and successful experience. Which means a broad and exact knowledge of what type, metal, diameter, length and twist-cut has been proven—out of Morse experience—to work best.

All specifications necessary to economical drilling may not occur to the user, when ordering. But when you put your problems up to Morse, all those factors are taken into consideration. Morse recommendations give you top drill performance per dollar. If you have drill troubles, run your eye over these Morse Special Purpose Drills . . . and then let Morse help you to decide on a drill (shown here, or not) that will do the best job for *you*. Your Industrial Supply Distributor will co-operate.

MORSE **Quick-Twist Drills (136** . . . for deep-hole drilling aluminum, magnesium, die-c metals; for slate, marble and cert plastics.

MORSE **Tungsten-Carbide-Tip Drills for Non-Ferrous Metals** and for abrasive materials, soft chilled cast-iron, asbestos, compounds, plastics.

MORSE **Cotter-Pin Drills (1386)** . . . for skin metal, shallow-hole drilling, cotter-pin holes, steering arms, knuckles, gas burners and copper. Ideal in portable drills.

MORSE **Brass Drills (1344)** Specially designed for work in brass. Made with wide grooves to clear chips easily Special slow spiral.

MORSE **Heavy-Duty Drills (1365)** for stainless steels, spring steels, hard cast iron, monel and hard-to-work materials.

MORSE **Cobalt Drills (2330)** . . . for hard materials, can be run 25% faster. Used in rigid drill press with positive power drive capable of extreme point pressure.

MORSE **Bakelite Drills (1361)** . . . for Bakelite, Ebonite, asbestos, fibre, brass, hard rubber, various molded plastics. Withstands abrasion.

MORSE **General-Purpose Drills (1330)** The general purpose drill used when special purpose drills are not required.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

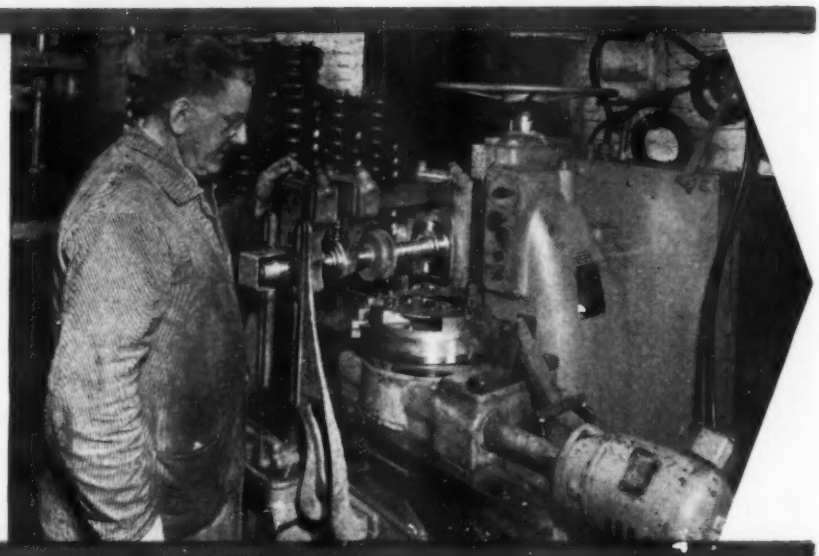
NEW BEDFORD, MASSACHUSETTS

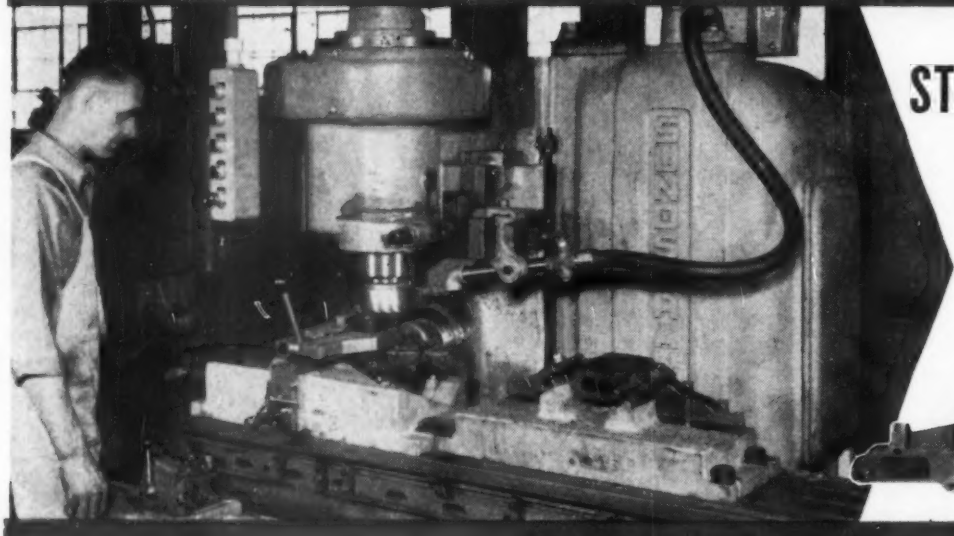
NEW YORK STORE: 130 LAFAYETTE ST. • CHICAGO STORE: 570 WEST RANDOLPH ST. • SAN FRANCISCO STORE: 1180 FOLSOM ST.

how to improve your MILLING

STANDARD RIGIDMILS WITH FIXTURES AND TOOLING TO SUIT YOUR WORK

1



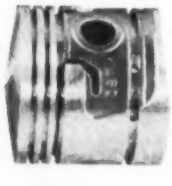


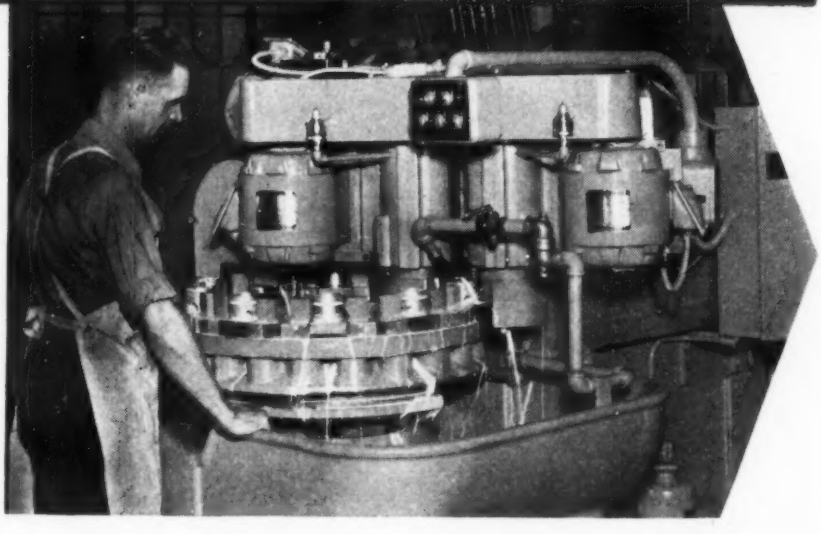
STANDARD RIGIDMILS WITH SPECIAL HEADS AND TOOLING

2

ENTIRELY SPECIAL MACHINES

3





UNDERWOOD MACHINE TOOL CO. ROCKFORD, ILLINOIS U.S.A.

RIGIDMILS | FLUID-SCREW RIGIDMILS | AUTOMATIC LATHES | HYDRAULIC EQUIPMENT

METHODS

Straddle milling three lugs on a clutch plate. This operation was formerly performed using a hand indexed table, a time consuming and tiresome operation. A standard Sundstrand No. 1 Rigidmil with a standard Sundstrand automatic index base provides full automatic cycle except for loading, unloading and the initial cycle start. Production is increased and operator's duties simplified with this new setup.

Milling three surfaces of a manifold on a standard Sundstrand Model 33 Fluid-Screw Rigidmil. The machine is equipped with a regular horizontal spindle and a special vertical spindle. Each spindle carries one T. C. tipped cutter. The table cycle is automatic so the operator can load at one fixture while another part is being milled in opposite fixture.

Both heads are adjustable so that a wide range of work can be accommodated at any time.

Sawing two slots and milling the radius in skirt of piston rings. This special 3 spindle Sundstrand milling machine utilizes two vertical spindles each of which saws one slot in skirt of piston. The horizontal spindle carries one cutter which mills the radius in the end of skirt. Ten individual fixtures are mounted on the rotary table. Each fixture locates and holds one piston which is automatically clamped as the piston approaches the cutters and unclamps after the cut. Production is approximately 1200 pieces per hour.

with SUNDSTRAND ENGINEERED PRODUCTION

There are two basic approaches to solving milling production problems: (1) obtaining standard machines, then trying to process parts over these machines as economically as possible, (2) designing the most profitable processing method, then obtaining machines to suit this method—standard or semi-standard machines if possible, or entirely special machines, if necessary.

This latter method is Sundstrand "Engineered Production" . . . a most practical approach to economical milling. Here's how it has been applied in three different plants on three different milling problems.

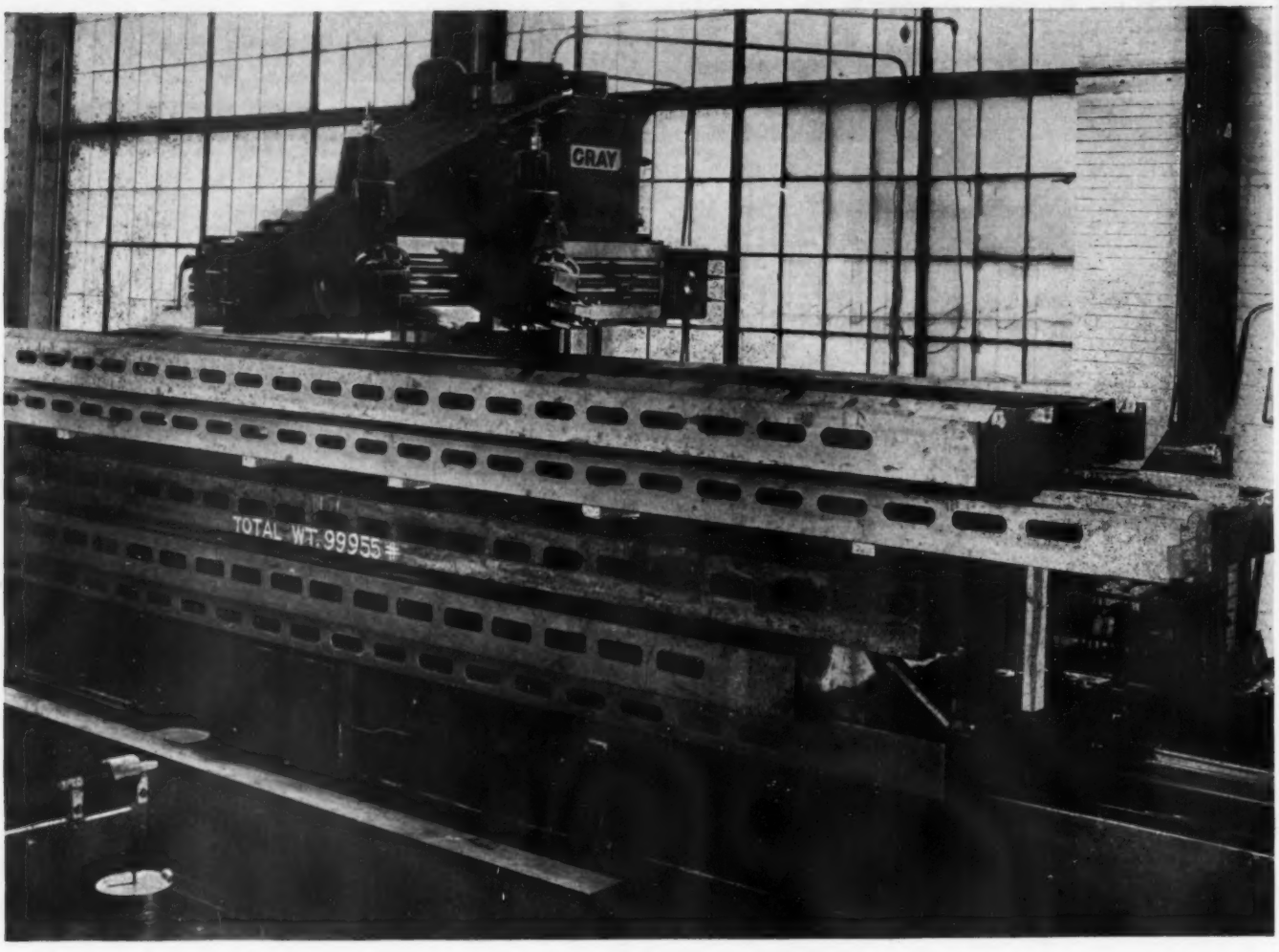
FREE

More proof of the successful application of Sundstrand "Engineered" milling production is contained in this book. Over 60 problem solutions complete with tooling diagrams are included. Write for your copy today. Ask for bulletin No. 152.

SUNDSTRAND MACHINE TOOL COMPANY

2533 Eleventh Street, Rockford, Illinois, U. S. A.

DRILLING AND CENTERING MACHINES | SPECIAL MILLING AND TURNING MACHINES



50 Tons on a 48" x 20' Openside!

JUST ONE OF THE GRUELING TESTS TO WHICH WE SUBJECTED THE

GRAY NON-METALLIC TABLE WAYS*

BEFORE WE WERE SATISFIED TO PIONEER THEIR USE

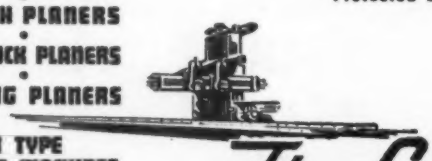
REMEMBER—

A machine tool is no better than its ways. There is no adequate substitute for the Gray non-metallic table ways*.

- DOUBLE HOUSING and OPENSIDE PLANERS
- SWITCH PLANERS
- DIE BLOCK PLANERS
- MILLING PLANERS
- PLANER TYPE MILLING MACHINES
- HORIZONTAL BORING MACHINES

Gray has been a leader for over sixty years, but no untried construction or materials are ever recommended—all are first given exhaustive, practical shop tests, such as the one illustrated above.

*Protected by patent #2,378,343 and patent pending.



The G.A. GRAY Co.

CINCINNATI 7, OHIO, U. S. A.

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

Amplex Division of Chrysler Corp. proposes an industry-wide study to standardize bearing sizes.

get ready with CONE for tomorrow

Dow Corning Corporation has a new white enamel made of silicone resins that approaches baked enamel in its resistance to heat.

get ready with CONE for tomorrow

Bell Telephone Laboratory engineers have demonstrated a "tone synthesizer" that can imitate the sound of any musical instrument.

get ready with CONE for tomorrow

Raytheon Mfg. Co. has a compact, rugged radar set for installation on merchant vessels.

get ready with CONE for tomorrow

An instrument called a "metal Sorter", made by Control Equipment Co. of Pittsburgh, identifies unknown metals by measuring the electricity they develop when rubbed by a known sample.

get ready with CONE for tomorrow

"Liquid Honing", a method of finishing metal surfaces with a spray of emulsion containing an abrasive as fine as 2,500 mesh, is being promoted by Vapor Blast Mfg. Co. of Milwaukee.

get ready with CONE for tomorrow

American Steel and Wire Co. has a nail that can be driven into steel with a hammer.

get ready with CONE for tomorrow

Plastics can now be dip-dyed at room temperature with solutions perfected by International Printing Ink. The color becomes integral, and the physical properties of the plastic are not changed.

get ready with CONE for tomorrow

Oil Well Chemical Service Company of Fort Worth has succeeded, with the help of Monsanto, in sealing oil wells as deep as 11,500 feet with a liquid resin that permeates rock and holds back unwanted natural gas.

A new combination tapping and threading attachment is now available for a leading line of six spindle automatics. The unit has a wide, selective, threading range; it can be mounted in any one or a number of endworking positions, as required, and it can be readily installed or changed over. A descriptive booklet is available.

get ready with CONE for tomorrow

Gulf Oil has an additive said to prevent foaming in lubricating oils.

get ready with CONE for tomorrow

University of California scientists have produced a standard for the measurement of length ten times as accurate as the cadmium light ray now accepted by using a light wave from transmuted mercury (made from gold) excited by a high frequency radio beam.

The Army and Navy are studying our natural caves, such as Carlsbad and Mammoth, in order to determine their usefulness as war-time shelters for industry.

get ready with CONE for tomorrow

Union Oil Co. has "Uniperox", a peroxide made from petroleum for use as a jet plane fuel, to improve diesel fuel oil and as a catalyst in the making of plastics.

get ready with CONE for tomorrow

The Ford Motor Company has announced its intention of erecting a $50 million laboratory for automotive research and engineering.

get ready with CONE for tomorrow

"Palestic" is a treatment for plaster which makes it as hard and strong as stone and also makes it adhere to plastics, metal or glass.

get ready with CONE for tomorrow

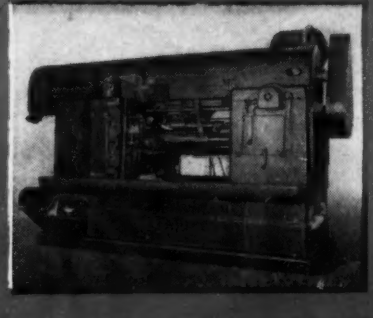
Tennessee Eastman claims that its Tenite plastic pellets blown from an ordinary blasting machine put a fine finish on aluminum castings.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

A TON of Chips every 15 hours

Every 15 hours a 5" 4-spindle Conomatic removes a ton of chips from SAE X-1315 bar stock to produce this piece within the time and tolerances required.

***You* can be ahead with a Conomatic.**



Ask your CONE representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

83

Once 10 petticoats were worn

And *once* you had to carry a lot of heavy tools . . . but not now . . . because the Hallowell Speed Tool Kits have really lightened the tool burden. These are very complete, compact units . . . that fit comfortably in the palm of the hand . . . *with interchangeable tools held in the hollow handles.*

Another tool-saving, time-saving feature is the *locking swivel bit-chuck,* which replaces angular tools, gives extra leverage and makes it easy to reach hard-to-get-at places.

Handles are molded of Lumarith,* a Celanese* plastic; tools are of high-grade alloy steel . . . to make a durable, useful device . . . up to "Standard" specifications in every way.

Obtainable at Suppliers throughout the country. If your Supplier does not carry these Kits, send his name to us, along with yours, and you will be taken care of promptly.

HALLOWELL SPEED TOOL KITS

WITH INTERCHANGEABLE TOOLS

The "Socket Wrench" Kits, in two sizes for a greater range of tools, contain 6 and 12 point Hex Sockets from No. 4 up to and including ½".

The "Socket Screw" Kits, in two sizes, contain carefully chosen bits, including Phillips, Flat and Hex.

The "Auto" Kits contain those small tools most necessary for auto maintenance . . . Phillips, Flat and Clutch head bits and a Reamer.

The "Home" Kit contains a clever assortment of frequently needed tools: Tack Lifter, Gimlet, Reamer, 2 Flat and a Phillips screw driver bit and a Bottle Cap Opener.

Excellent ideas for gifts or prizes.

Handles Molded of Lumarith* A Celanese* Plastic

Kits: Patents Pending

OVER 43 YEARS IN BUSINESS

*Reg. U. S. Pat. Off.

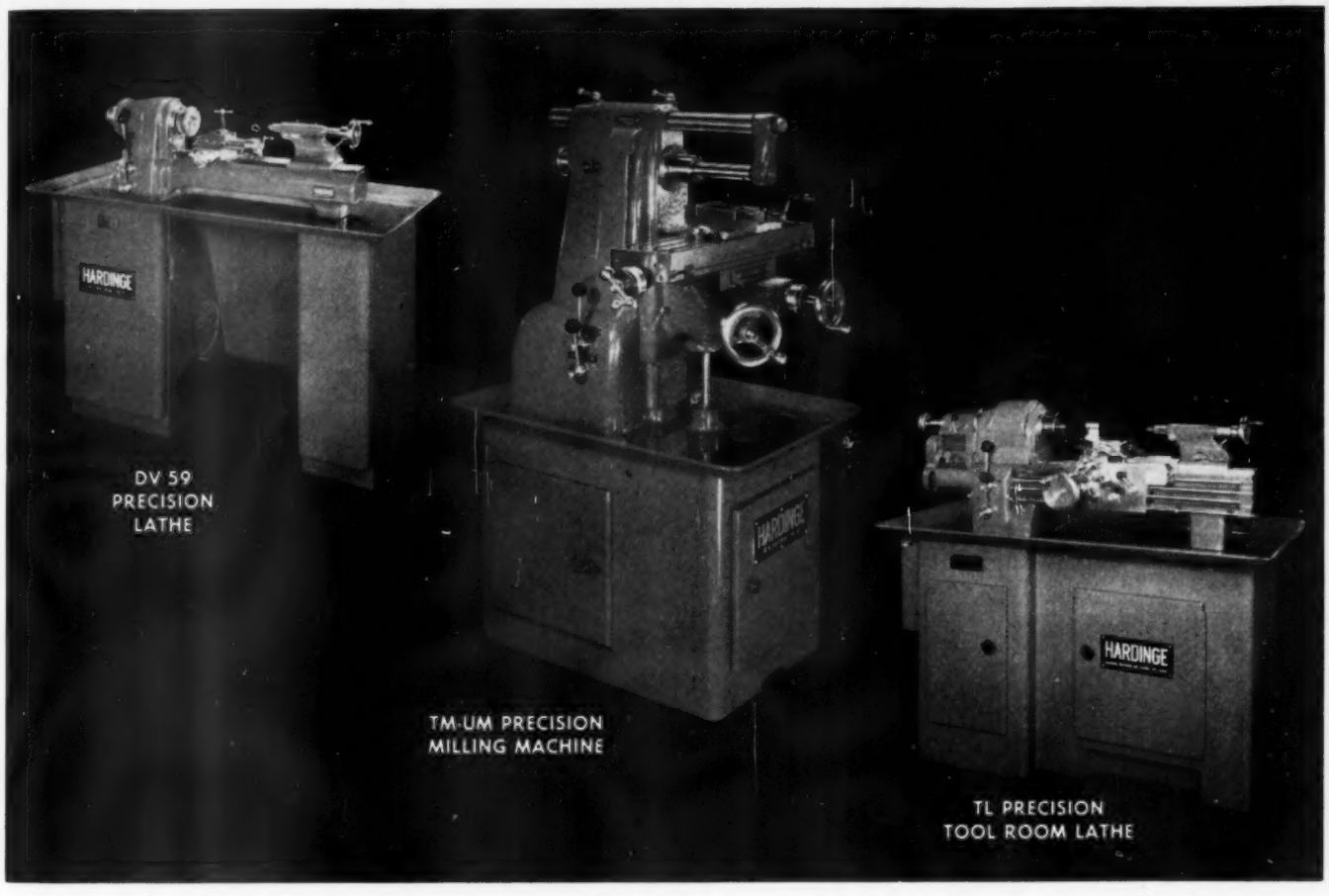
STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

HARDINGE
ELMIRA, N.Y.

MATCHED FOR PRECISION TOOL ROOM WORK

HARDINGE High Speed Precision Lathe
HARDINGE High Speed Precision Milling Machine
HARDINGE High Speed Precision Tool Room Lathe



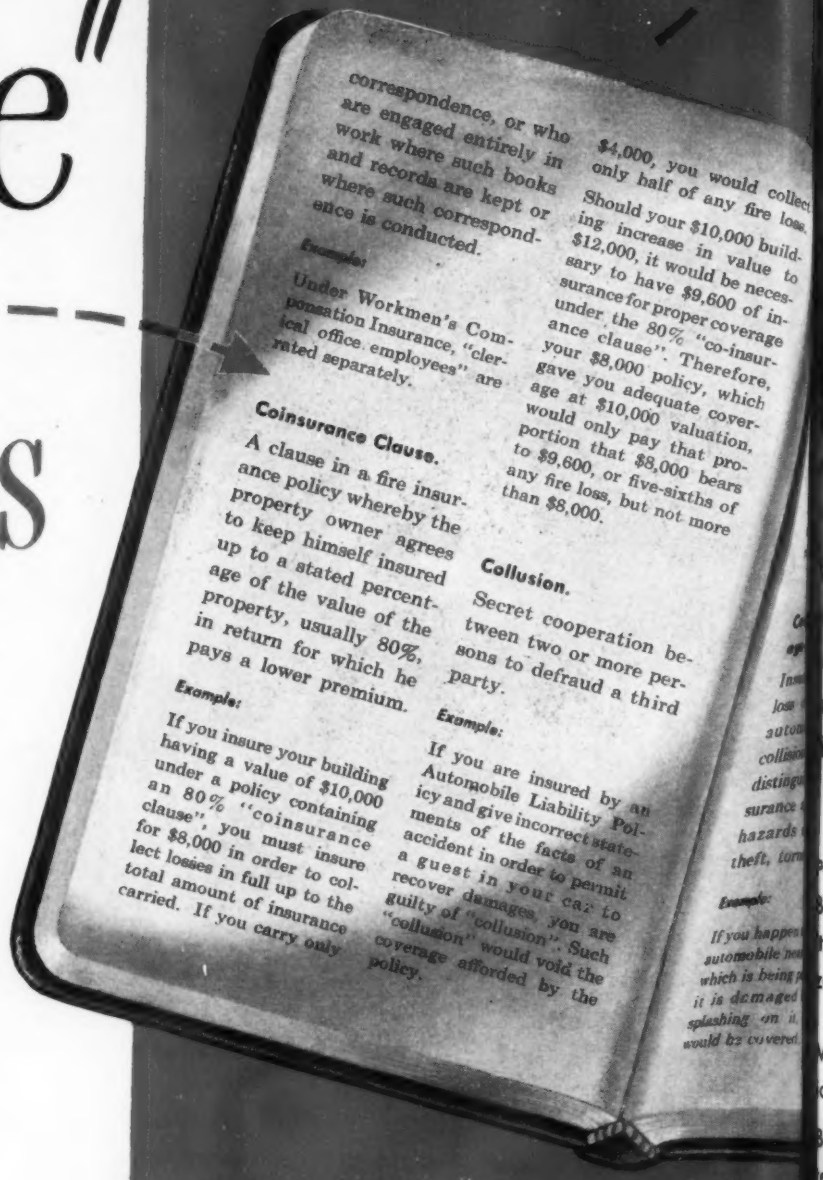
Here are three machines that are specifically matched together to step up precision production in your tool room, laboratory and development departments—the HARDINGE High Speed Precision DV 59 Lathe, the HARDINGE High Speed Precision TM-UM Milling Machine, and the HARDINGE High Speed Precision TL Tool Room Lathe.

Now you can handle, with facility, the greater portion of your tool room type work with lower costs than when done on large, slow machines. Interchangeability of attachments among these Hardinge matched machines permits handling a variety of work with minimum expense. For example, all spindles take standard 5C HARDINGE 1" capacity collets, including the spiral or plain index centers for the milling machine.

Write for illustrated bulletins which give complete details.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

"Coinsurance Clause"



correspondence, or who are engaged entirely in work where such books and records are kept or where such correspondence is conducted.

Example:

Under Workmen's Compensation Insurance, "clerical office employees" are rated separately.

Coinsurance Clause.

A clause in a fire insurance policy whereby the property owner agrees to keep himself insured up to a stated percentage of the value of the property, usually 80%, in return for which he pays a lower premium.

Example:

If you insure your building having a value of $10,000 under a policy containing an 80% "coinsurance clause", you must insure for $8,000 in order to collect losses in full up to the total amount of insurance carried. If you carry only $4,000, you would collect only half of any fire loss.

Should your $10,000 building increase in value to $12,000, it would be necessary to have $9,600 of insurance for proper coverage under the 80% "co-insurance clause". Therefore, your $8,000 policy, which gave you adequate coverage at $10,000 valuation, would only pay that proportion that $8,000 bears to $9,600, or five-sixths of any fire loss, but not more than $8,000.

Collusion.

Secret cooperation between two or more persons to defraud a third party.

Example:

If you are insured by an Automobile Liability Policy and give incorrect statements of the facts of an accident in order to permit a guest in your car to recover damages, you are guilty of "collusion". Such "collusion" would void the coverage afforded by the policy.

EMPLOYERS MUTUALS

(OF WAUSAU)

make this and other Insurance terms

Understandable

EMPLOYERS MUTUALS of WAUSAU

is important to you to understand what "Co-surance Clause" means. It may cost you oney not to know.

is equally important that you know, and un-erstand, many other terms used in insurance olicies.

You CAN Understand Insurance

ou will begin to understand insurance as soon s you know the meanings of insurance terms.

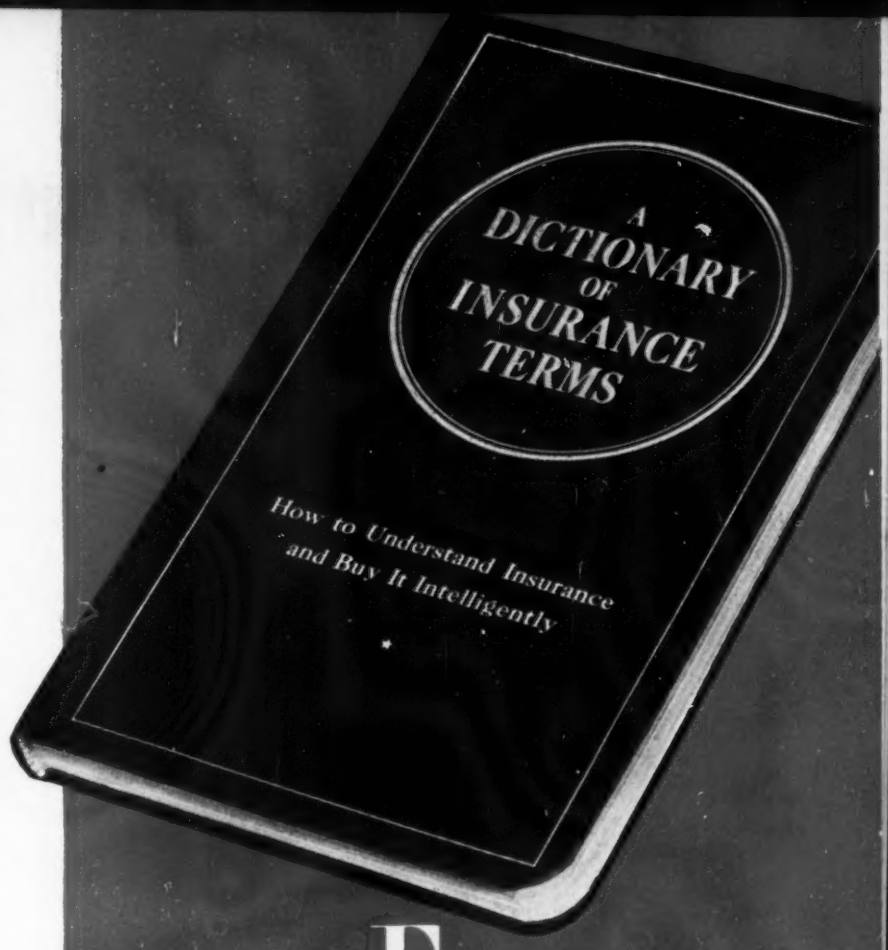
ere is the most important and helpful book ver published. More than 200 insurance words nd phrases have been defined in one volume in ompletely nontechnical language. Specific ex-mples are cited to demonstrate the application f many of these insurance terms. As easy to nderstand as A B C.

Write for your FREE copy today. Find out for ourself how this Dictionary helps you under-tand insurance. Address: Insurance Infor-nation Bureau, Employers Mutuals of Wausau, Wausau, Wisconsin.

Employers Mutuals write:

Public Liability . . . Automobile . . . Plate Glass . . . Burglary . . . Workmen's Compensation . . . Fidel-ty Bonds . . . Group Health, Accident, Hospitali-zation . . . and other casualty insurance . . . Fire . . . Tornado . . . Extended Coverage . . . Inland Marine . . . and allied lines of insurance. All pol-cies are nonassessable.

Branch offices in principal cities. Consult your elephone directory.



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A Dictionary of Insurance Terms

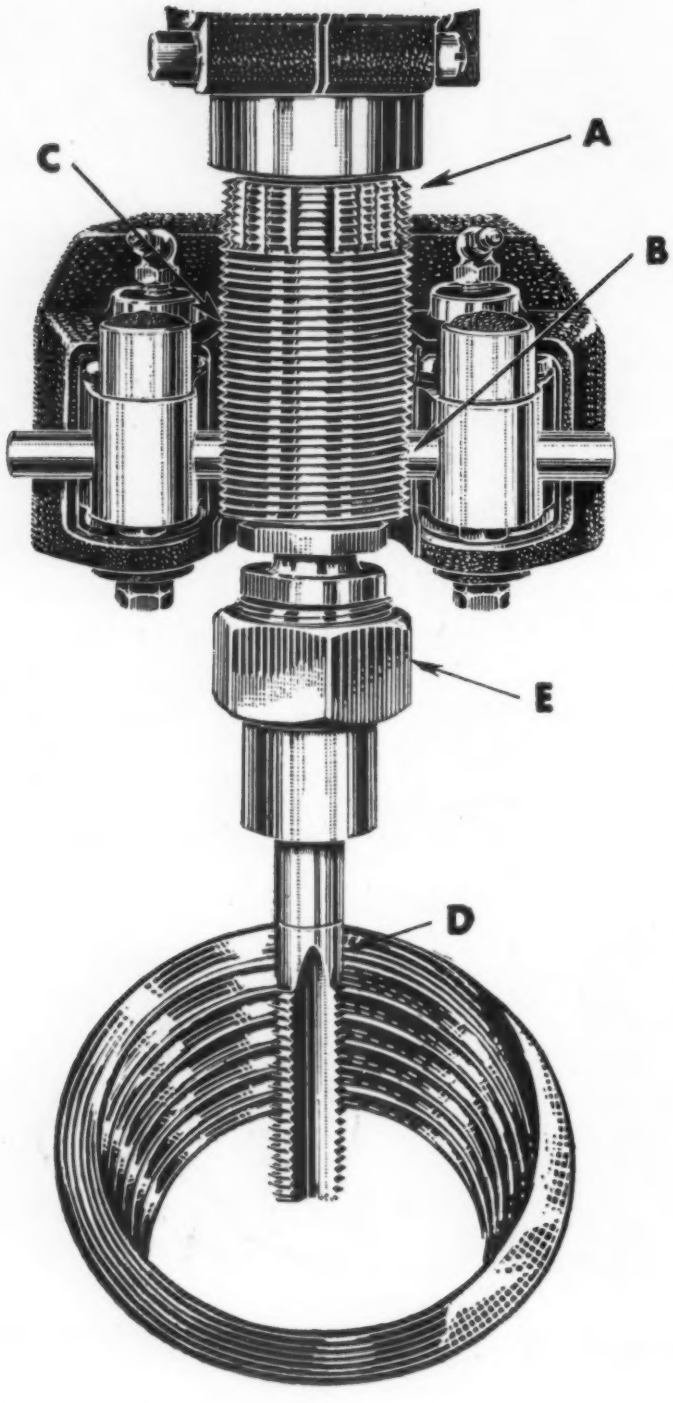
How to Understand Insurance and Buy It Intelligently

The BIGGEST little book ever written on insurance—the little book that helps you understand a big business as it concerns you.

. make Insurance Understandable

EMPLOYERS MUTUAL LIABILITY INSURANCE COMPANY OF WISCONSIN
EMPLOYERS MUTUAL FIRE INSURANCE COMPANY
Home Office: WAUSAU, WISCONSIN

The final operation that can mean



The Secret of Extreme PRECISION Tapping and Threading

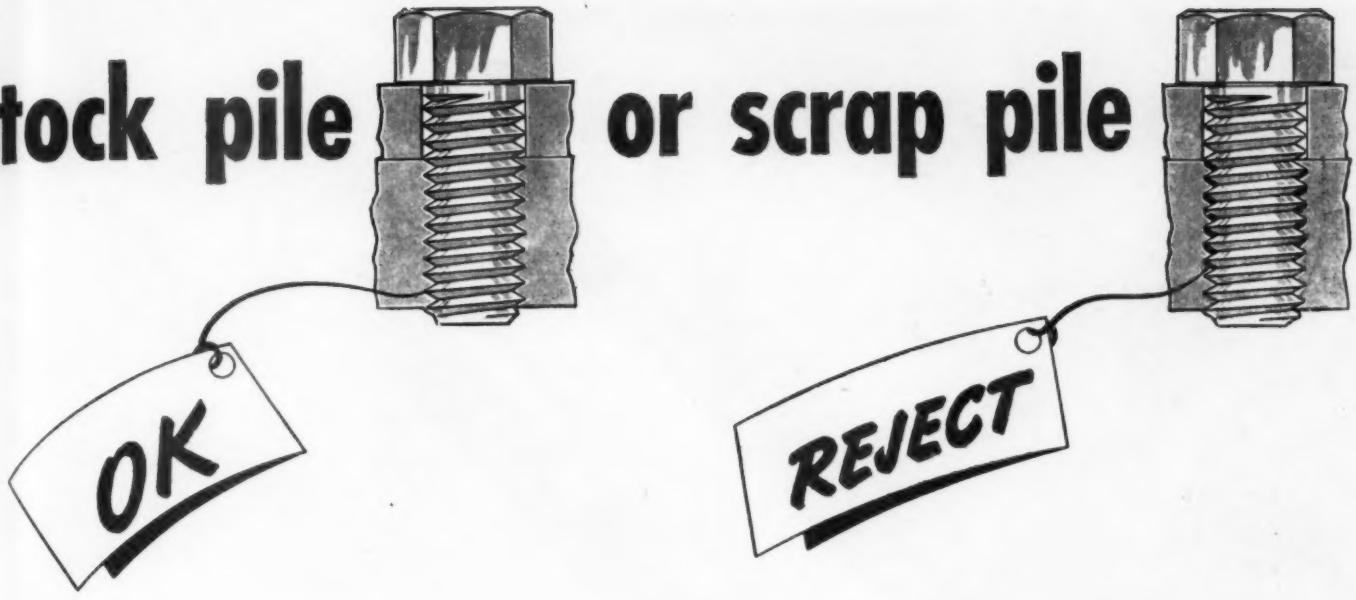
A completely new and exclusive principle—the combination of lead screw and solenoid actuated guide fingers—makes possible the faster production of class 3, 4 and 5 gage fits in cutting internal and external threads. The upper portion of the lead screw (A) is a hob which cuts perfectly matched mating threads into the brass guide fingers (B) to match the pitch of the lead screw (C) and the tap (D). Solenoid action firmly engages the guide fingers and lead screw to maintain positive control throughout the entire threading cycle. This patented mechanism compensates for wear of guide fingers against lead screws and eliminates lead errors and backlash.

To keep pace with the developments made in taps and tapping machines, Warner & Swasey also has designed a line of hardened and ground collets and drivers (E) to hold taps and enable users to take full advantage of the extreme precision built into the machines which comprise the complete line of Warner & Swasey Tapping and Threading Machines.

NO. 11
CAPACITY
8-36 TO ⅞"

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . . . WITH A WARNER & SWASEY TURR

...stock pile or scrap pile



PRECISION tapping and threading is often the final step in finishing a piece that has undergone many previous machining operations. Here is where inaccurate fits or thread errors can mean costly scrap loss and upset production schedules.

Get High Precision Threading on a Profitable Production Basis

Warner & Swasey Precision Tapping and Threading Machines introduce many new advantages to reduce wasteful rejects that result in loss of valuable machine time and manhours. They feature a radically new and exclusive leading-on principle for positive control on tapping and retracting strokes, preventing backlash or drag; a supersensitive clutch that can be adjusted to safe torsional resistance to stop the tapping operation immediately when the tap hits a hard spot or chip accumulations, saving spoiled threads or broken taps; a precision depth control device which permits depth accuracy to within 1/10th of a revolution of the tap or die.

These and other special features insure fast, extremely accurate tapping to class 3, 4 and 5 gage fits in a wide range of materials—from tool steel to plastics.

Warner & Swasey Precision Tapping and Threading Machines can probably increase production and cut scrap loss in your shop. Our field representative will be glad to discuss your tapping problems, without obligation. Call your nearest Warner & Swasey office, or write direct to Warner & Swasey Company, Cleveland 3, Ohio.

NO. 11R—RADIAL CAPACITY 8-36 TO ⅞"
(Available with additional independently operated tapping head)

NO. 12 CAPACITY ⅜" TO 2½"

WARNER & SWASEY
Machine Tools
Cleveland

...WASEY TURRET LATHES. MULTIPLE SPINDLE AUTOMATICS. PRECISION TAPPING AND THREADING MACHINES

SMALL GEAR SPECIALISTS

G.S. *specializes* in doing ONE thing only . . making Fractional Horsepower GEARS. Customers tell us the Small Gears we make are better in design, run more smoothly, last longer . . that they give greater service and satisfaction. Anyway, that's our aim! . . to produce precision custom gears in quantity to such exacting specifications and to such high quality standards that people will not only continue sending us their orders, but will also recommend us to their friends. Come to "headquarters" for the Small Gears *you* need. Get the kind of service you've always wanted!

GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

2635 WEST MEDILL AVENUE • CHICAGO 47, ILLINOIS

MEMBER OF AGMA

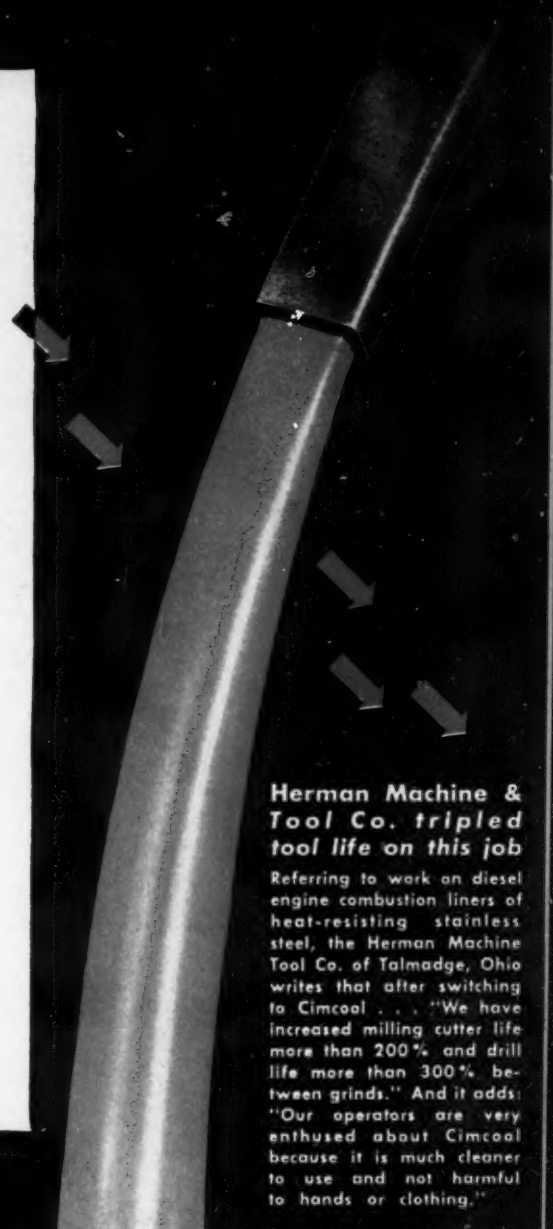
WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

Want to increase cutter life 200%?

Startling increases in tool life are common when plants switch to Cimcool Cutting Fluid. For Cimcool is radically new and different—a *chemical emulsion* that combines friction reduction and cooling capacity in a degree never before obtained.

and with Cimcool...

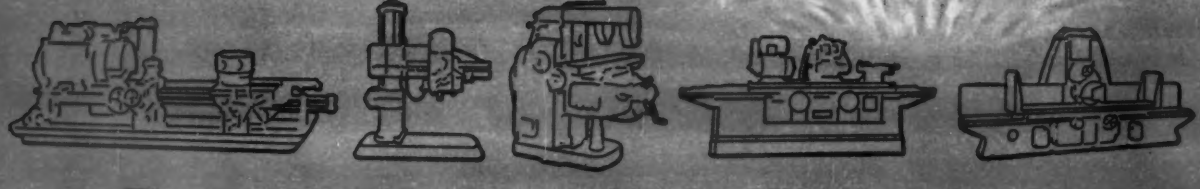
- Faster cooling allows faster cutting.
- Uniform work temperature increases accuracy.
- Long lasting rust inhibitor is included.
- Non-irritating... doesn't grow rancid.
- No fire hazard... No slippery film.
- Covers 85% of all metal working jobs.



Herman Machine & *Tool Co. tripled tool life on this job*

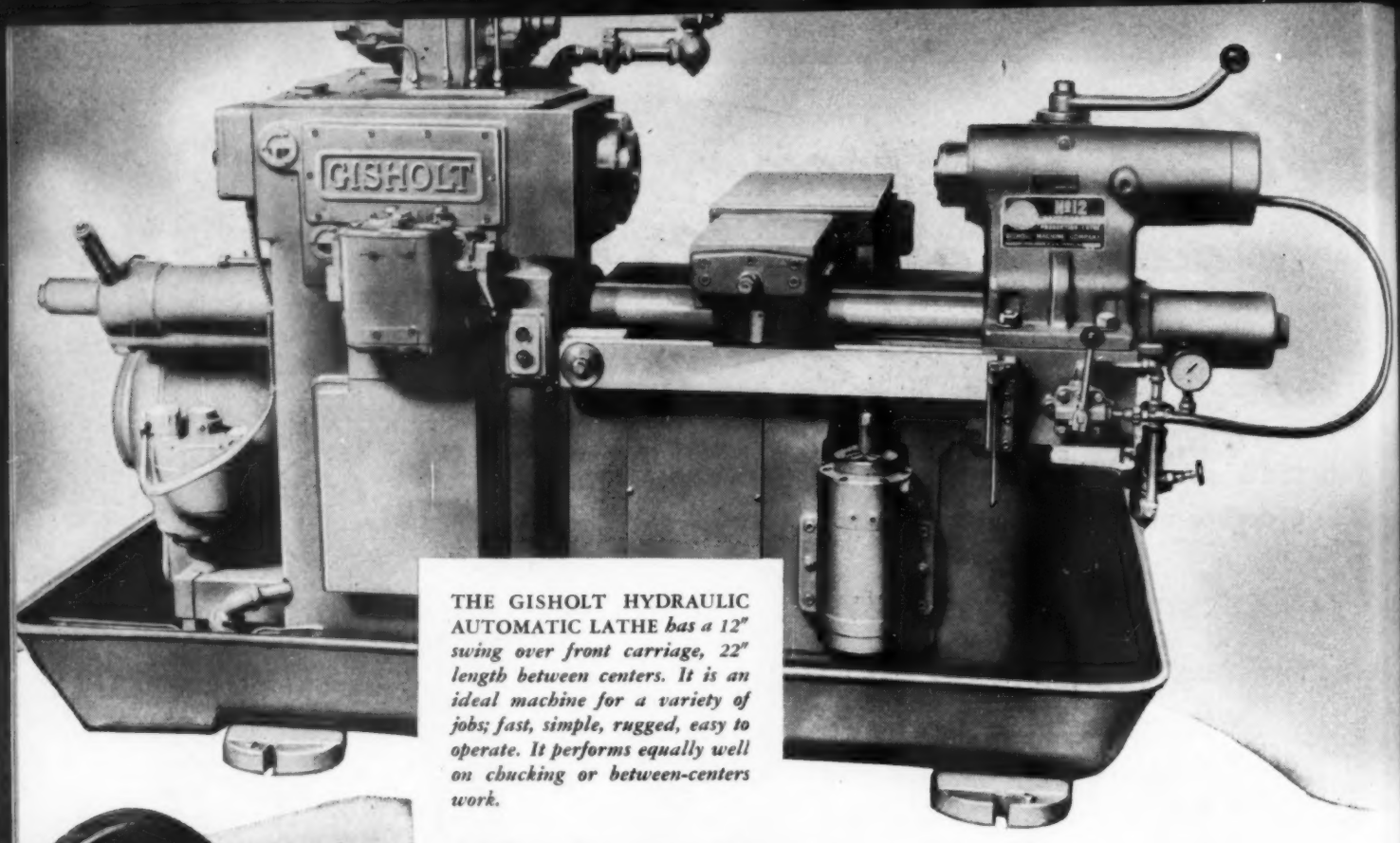
Referring to work on diesel engine combustion liners of heat-resisting stainless steel, the Herman Machine Tool Co. of Talmadge, Ohio writes that after switching to Cimcool . . . "We have increased milling cutter life more than 200% and drill life more than 300% between grinds." And it adds: "Our operators are very enthused about Cimcool because it is much cleaner to use and not harmful to hands or clothing."

CIMCOOL DIVISION OF
THE CINCINNATI MILLING MACHINE CO.,
CINCINNATI 9, OHIO, U. S. A.

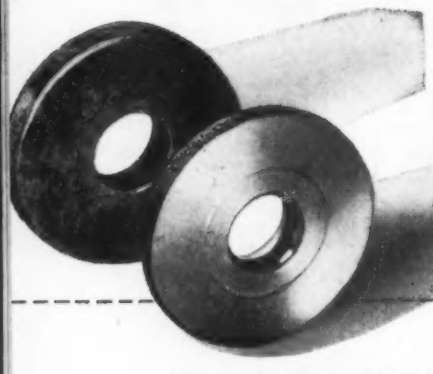


CIMCOOL

THE MULTI-PURPOSE CUTTING FLUID



THE GISHOLT HYDRAULIC AUTOMATIC LATHE *has a 12" swing over front carriage, 22" length between centers. It is an ideal machine for a variety of jobs; fast, simple, rugged, easy to operate. It performs equally well on chucking or between-centers work.*



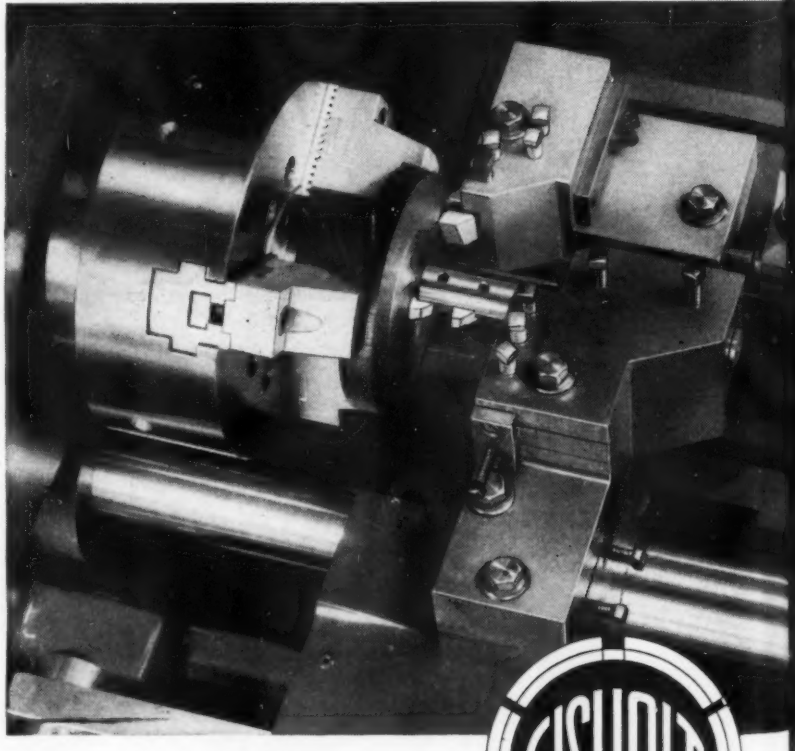
FLEXIBILITY
in an Automatic Lathe

THE GISHOLT
HYDRAULIC AUTOMATIC
LATHE

Here, with the same basic tooling and slide arrangement, the Gisholt Hydraulic Automatic Lathe handles the machining of *three different types* of pipe flanges: threaded, Van Stone and slip-on. These flanges range from 1¼" to 2½" pipe size. The machine permits either straight or taper boring.

Such extreme flexibility is unique in a machine of this type. It is due to the ease of control and adjustment provided by the Gisholt Hydraulic Automatic Lathe. In setting up or adjusting tools, the operator has complete freedom of arrangement with regard to approach, feed, stop or return. He can do manually what is done by hydraulic pressure during the cycle of the machine.

Flexibility is only one of many outstanding features of this modern automatic lathe. If you have parts to produce in volume, why not learn about all of them? Learn what it can do to maintain accuracy at high speeds and cut your costs.



GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison 3, Wis.

Look Ahead... Keep Ahead ... with Gisholt

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

If you want

Outstanding Performance

you want a LEMPCO ACX GRINDER

Here are the facts that enable the Lempco ACX Multi-Purpose Grinder to outperform any similar machine in its price class.

Lempco's patented auto sizer enables piece after piece to be accurately ground to identical size without losing valuable man hours for redressing wheel. Two-to-one ratio makes rack and pinion feed fast and accurately. With the ACX many operations can be done without changing set-up. Chucks are mounted or demounted on face plate quickly by means of a single draw bar through the hollow spindle.

The Lempco ACX Grinder offers other money-saving features. These are listed below. Check them carefully. They mean fast, low cost production in your tool room or on your production line.

For complete details, send for catalog.

LEMPCO

5711 DUNHAM ROAD
BEDFORD, OHIO

1. Interchangeable Grinds and Turns.
2. External Grinds and Turns.
3. Internal Grinds and Turns.
4. External Taper Grinds and Turns.
5. Internal Taper Grinds and Turns.
6. Face Grinds and Turns.
7. Automatic Power Cross Feed.
8. Wide Range of Adaptability.
9. A single set-up will allow for two or more operations, guaranteeing greater accuracy of the piece being machined.
10. Self-contained direct motor drive to coolant pump assures adequate supply of coolant from 10-gallon tank. Flow is adjusted by valve at nozzle.

Choosing THE ONE

Actually, there are more than a million possible combinations of abrasive, type of bond, grade, grain size, structure, and shape in which a grinding wheel might be made. Seemingly, this vast number presents a terrific problem in the accurate selection of the one wheel best suited for any particular grinding operation. In practice, it is a relatively simple matter.

In the first place, your own experience quickly narrows the field to a relatively few wheels from which the final choice is made. And, it is in making this last decision where more and more top drawer production men depend on the advice and suggestions of an abrasive specialist.

Your CARBORUNDUM representative is always prepared to offer competent assistance in selecting grinding wheels that give better

A good rule for good grinding... **CALL**

in a Million!

grinding at minimum cost. His thorough analysis of your grinding operations provides a dependable double check on their efficiency. Often, he can offer a practical suggestion for improvement. For he is fully aware of the latest developments in abrasives and their application. What is more, his very business brings him in daily contact with a variety of modern grinding jobs.

Where the problem is especially difficult or involved, he can call in one of our Abrasive Engineers. If necessary, the facilities and resources of the world's best known abrasive laboratories are available.

When you call in CARBORUNDUM, you receive cooperation that assures you of getting the most out of your grinding operations and abrasive wheels. The Carborundum Company, Niagara Falls, New York.

IN CARBORUNDUM

TRADE | MARK

BONDED ABRASIVES

WHEELS
- Silicon Carbide
- Aluminum Oxide
- Diamond

Cylinder Hones
Sticks, Stones & Rubs
Specialties

COATED ABRASIVES

Paper, Cloth and Combination
Sheets, Rolls, Discs

ABRASIVE GRAINS AND COMPOUNDS

for:

Polishing
Lapping
Pressure Blasting
Finishing

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company

1 G. & L. MACHINE Completes

Over 75 Contour Milling . . . Drilling . . . Boring . . . Reaming . . . Tapping . . . Slotting and Back-facing Operations Are Quickly Performed as Casting Is Indexed on Trunnion Type Holding Fixture.

Regardless of intricacy of the workpiece, an almost unlimited range of machining operations can be handled rapidly and accurately on a Giddings & Lewis horizontal boring machine. This unusual and irregular shaped machine component requiring numerous operations is an excellent example of a difficult part, completed on a *standard* G. & L.

More than 75 operations are performed as the part is placed in 9 different positions. A trunnion type holding fixture indexes the different angular surfaces so they are at right angles to the cutters. With this accomplished, it is a simple matter to extend the G. & L. machine spindle and cutting tool to hard-to-reach internal pads, bores, bosses and slides. Over-all machining time including work settings is approximately 33 to 35 hours. Allowable tolerances on most surfaces are plus or minus .001″ and bearing holes are held to .0005″.

Sequence of Operations in Different Work Positions

1st Position — Rough mill face and lineup bosses.

2nd Position — Bore 2 end holes. Open set-up.

3rd Position — Place on angle plate trunnion. Finish bottom face. Drill and back spot face 6 holes.

4th Position — Mill cover plate *(contour milling)*.
Mill cap boss—drill and tap 2 holes for cap.

5th Position — Turn end for end set on 35° angle fixture.
Face mill gear cover box.
Mill cored bearing surface—mill 2″ slot.
Mill 2⅜″ slots.
Drill 7 holes—back spot face 6.
Drill ¾″ hole.

6th Position — Locate on slotted bearing and mill edge—drill and tap 8 holes. Drill and ream 2 holes 65° off cover face.

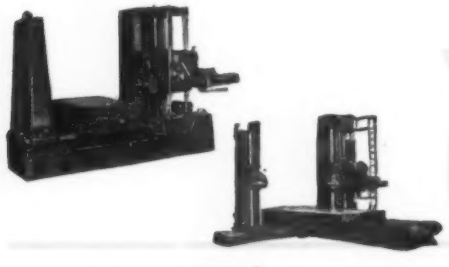
7th Position — Turn end from end.
Counterbore—5¼″ holes.
Bore—2-2.441″ bearing holes.
Bore—1.575″ hole.
Counterbore—2⅛″ hole.
Bore—1.850″ bearing hole.
Mill angular pad inside cover plate.

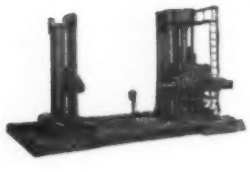
8th Position — Mill gear rack slide on inside 13/16″—¾″—⅛″—.375″ deep.

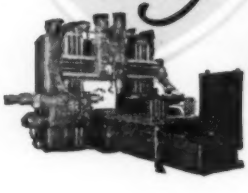
9th Position — Set on original locating surface and bore center bearing. Index 90° and bore internal bearing.

More Jobs - More Operations - More Profit With a G. & L.

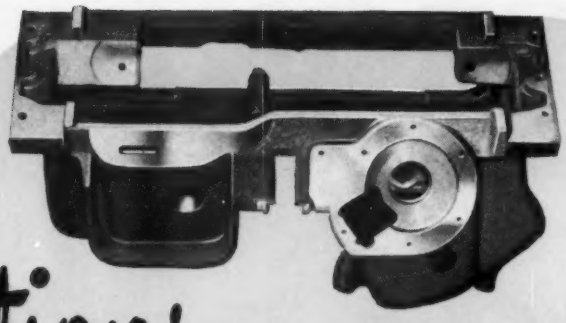
Flexibility and versatility of the Giddings & Lewis Horizontal Boring Machine will enable you to perform more jobs and more operations to increase your machining profits. Giddings & Lewis engineers will gladly show you how to solve difficult machining problems and produce more with standard G. &. L. machines. There is no obligation for this service.



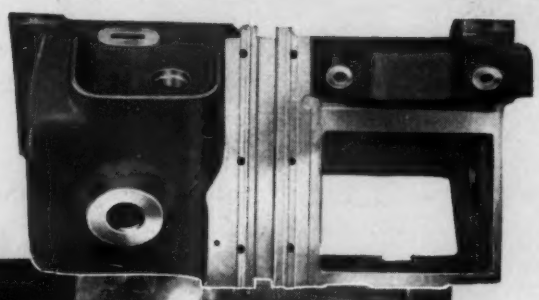




G&L Giddings

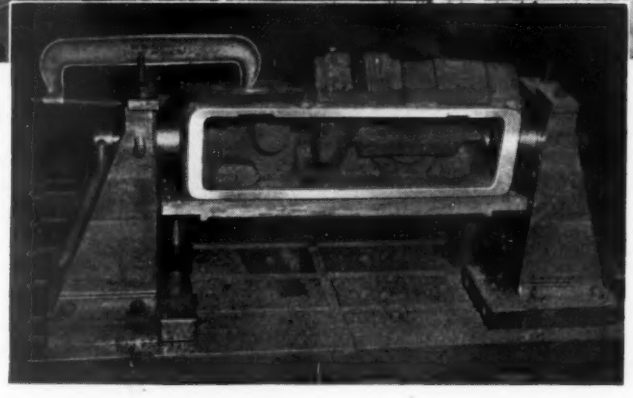


all operations ON THIS COMPLICATED PART



Irregular shaped machine part showing a number of operations performed with the Giddings & Lewis machine.

Contour milling the cover plate of an intricate machine part. This operation is performed quickly and easily by using table and headstock feeds to move cutting tool as shown.



Simple trunnion type holding fixture that indexes angular surfaces correctly for different machining operations.

Helpful
FIELD PERFORMANCE DATA
Free!

Write today for actual field stories showing how many difficult machining jobs are handled on Giddings & Lewis Horizontal Boring, Drilling and Milling Machines. In writing, ask for this valuable information as presented in the Production Data Folder A. M. 96.

G&L Lewis MACHINE TOOL CO.

138 DOTY STREET • FOND DU LAC, WISCONSIN

ARMSTRONG
TOOL HOLDERS

ARMSTRONG TOOL HOLDERS are known for their great strength—their ability to stand up to the heaviest cuts on the largest machine tools. However, it's on the delicate jobs like the one illustrated here where a 1⅛" shaft is turned from .187" to .109" diameter with "Tolerance: *None*" that their superiority of design is manifest.

Here is more than strength, than absolute rigidity—here is cutting efficiency. The ability to take uniform cuts measured in ten thousandths of an inch along a .109" diameter shaft held at one end.

There are ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters, and shapers. Each is an efficient cutting tool, the best available tool for its specific operation. All are permanent, multi-purpose tools that "Save All Forging, 70% Grinding, and 90% High Speed Steel."

Photographs courtesy R. K. LeBlond, Machine Tool Co.

Part: Small Die Shaft

Operation: Reduce diameter of Kinite steel shaft from .187" to .109"

Length: 1⅛"

Finished Diameter: .109"

Tolerance: NONE

Machine Tool: 13" LeBlond Regal Lathe

Cutting Tool: ARMSTRONG Left Hand Off-Set TURNING TOOL with square high speed steel cutter-bit.

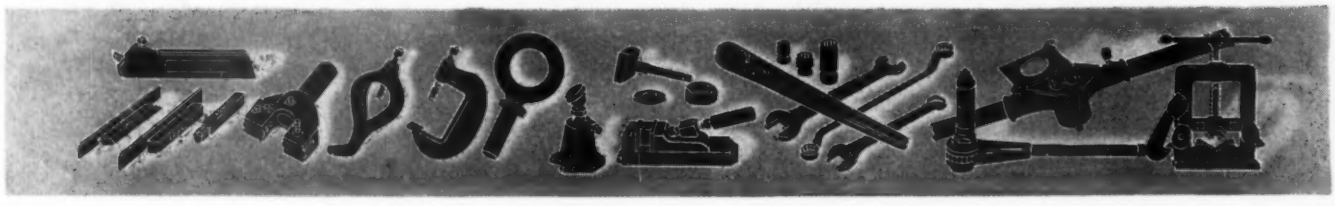
Place: Photographs taken at American Lava Corporation, Chattanooga, Tenn. NOTE: At this plant, even smaller shafts, down to .010" diameter are frequently and regularly machined with the same set-up illustrated.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVE. • • CHICAGO 12, U. S. A.

Eastern Whse. and Sales: 199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. and Sales Office: 1275 Mission St., San Francisco 3, Calif.



8 Reasons Why You Should Use VINCO Gear Rolling Inspection Fixtures

1. **Provide fast, accurate check of runout and backlash on one fixture.**
2. **Eliminate necessity of sample gears for backlash setup.**
3. **Duplicate assembly conditions wherever possible.**
4. **Eliminate mathematical computations.**
5. **Simplify inspection and reduce inspection time.**
6. **Inspect a wide variety of gear sizes on one fixture.**
7. **Minimize bench and floor space.**
8. **Help you produce better gears.**

MILLIONTHS OF AN INCH FOR SALE BY VINCO

REG. U. S. PAT. OFF.

VINCO CORPORATION, 8851 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN; SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

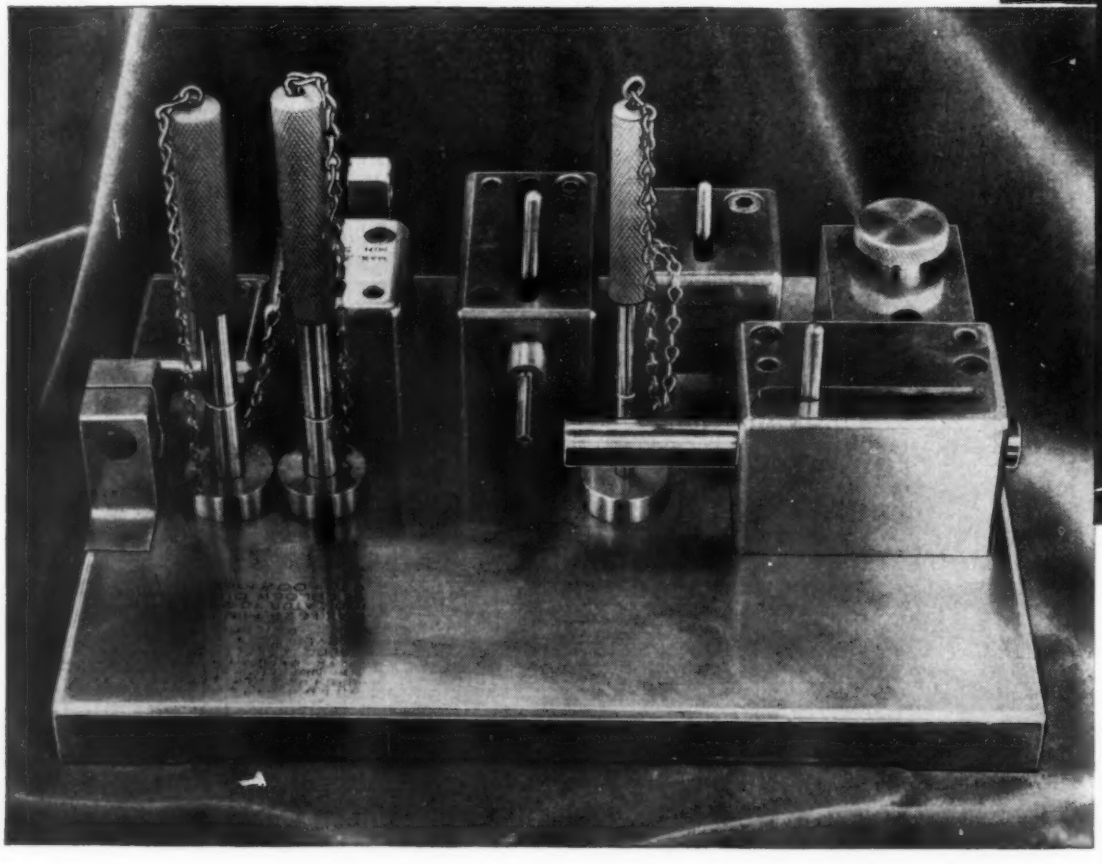
Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Shaft and Hub Gages • Built-up and Special Gages • Gear Rolling Inspection Fixtures • Indexing Fixtures • Hydraulic Power Control, Utilization and Distribution Units • Engineering, Design and Development • Precision Production Parts.

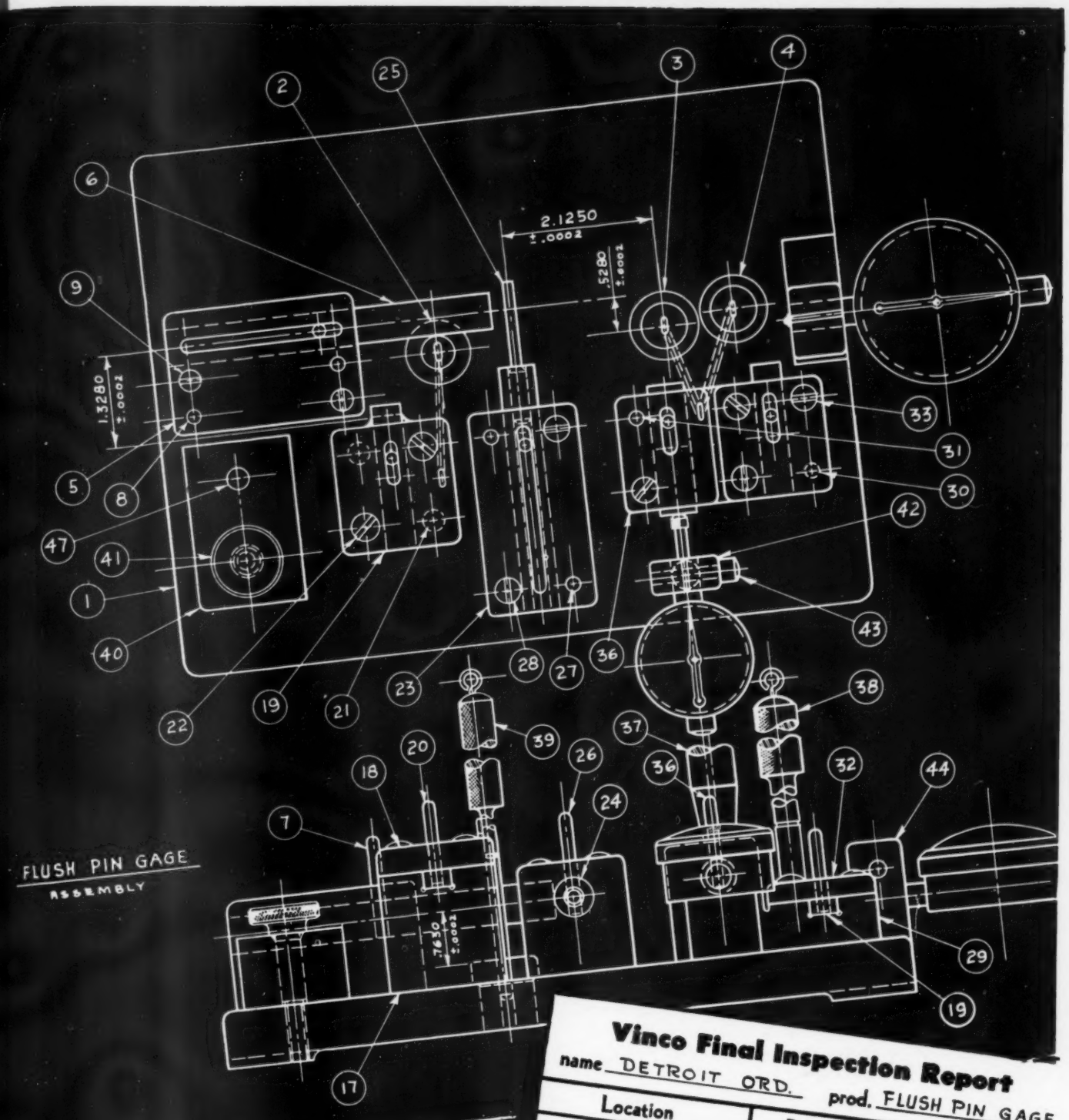
They Came to VINCO

And got the accuracy they needed

Run your eye over the tolerances on the dimensions which had to be maintained on this flush pin gage. They are typical of the high standard of excellence that VINCO customers confidently expect in all VINCO Gages. The pictorial story is more eloquent than words. It not only shows the perfection of the finished product; it also bears witness to the combined handiwork of engineering knowledge and mechanical skill that is the basis of this perfection. That selfsame knowledge and skill is the most highly prized asset at VINCO. This fact should merit your careful consideration when inadequate gaging is hampering your production schedules.

VINCO CORP. • DETROIT 27, MICHIGAN





Vinco Final Inspection Report

name DETROIT ORD. prod. FLUSH PIN GAGE

Location	Dimension	Actual
℄ DET. ⑥ TO FACE ON DET. ⑰	1.3280 ±.0002	1.3282 ✓
℄ DET. ⑥ TO ℄ DET. ③	.5280 ±.0002	.5281 ✓
℄ DET. ㉕ TO ℄ DET. ③	2.1250 ±.0002	2.1251 ✓
℄ DET. ㉕ TO TOP OF ②③④	.7630 ±.0002	.7632 ✓
HORIZONTAL ℄ DET. ②℄③	.0250 ±.0002	.0250 ✓
HORIZONTAL ℄ DET. ③℄④	.0400 ±.0003	.0400 ✓
VERTICAL ℄ DET. ②℄③	3.1530 ±.0001	3.1531 ✓
VERTICAL ℄ DET ③ ℄④	.9690 ±.0001	.9691 ✓
O.D. DET. ㊲	.3690 -.0001	
ANGLE DET.		

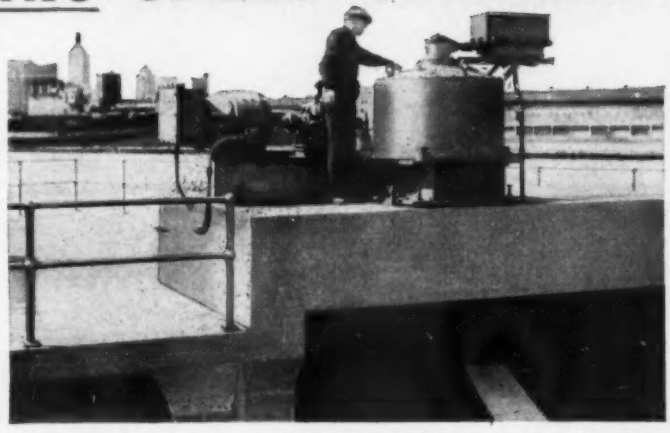
LEFT—The photo of the finished Flush Pin Gage shows the fine quality of finish achieved on the completed product. This is typical of all VINCO workmanship.

RIGHT—A section of the actual VINCO inspection report, covering the dimensions and tolerances required on this Flush Pin Gage. Such thoroughness is typical of VINCO procedures.

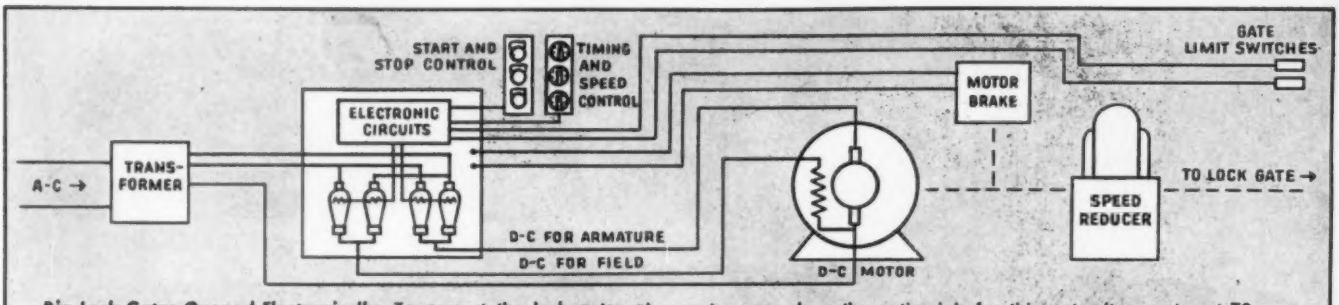
Step-Up machine performance with—
AUTOMATIC ELECTRONIC SPEED CHANGING

● You simply preset the desired speed levels and Thy-mo-trol drive does the rest!

Today, machine designers are taking advantage of the adaptability of G-E Thy-mo-trol drive. For example, in getting automatic speed change from one preset level to another, the drive can be used in conjunction with an electric timer so that the change occurs after a definite time. It can be used with limit switches or photoelectric relays so that the change will occur when some moving part reaches a predetermined position. Or, it can be used with a tachometer generator so that the change occurs when some rotating part reaches a certain speed. And—the speed change is made entirely by electrical means through the use of electronic control.



An unusual and interesting application of G-E Thy-mo-trol drive has been made to the lock gates at the mouth of the Chicago river. View above shows the d-c drive motor and the diagram below shows how it works.



Big Lock Gates Opened Electronically. To prevent the lock gates at the head of the Chicago river ship canal from being "cracked" too rapidly, which might cause dangerous water current, a two-speed gate drive is used. Originally, two motors, one high- and one low-speed, were used in a single closing or opening operation. The changeover from high to low speed required a complicated gear arrangement and the constant attention of a trained operator. A G-E Thy-mo-trol drive was installed on one of the four gates and one d-c motor now does the entire job for this gate. It operates at 70 rpm during the low-speed phase and then automatically accelerates to 1750 rpm for high-speed operation. An operator merely sets a timer at a control station to determine when the gate drive will accelerate to high speed or drop to low speed. The change in speed may also be given by a limit switch on the gate. Fast and slow speeds are preset by two dials, and a third dial sets the time. A second limit switch de-energizes the drive and sets the drive brake.

A VERSATILE TOOL

Automatic speed changing is only one of a variety of jobs in which Thy-mo-trol drive is saving time and improving production techniques. It is now being used on machine tools and production-line equipment—(1) to give stepless speed control over a wide range, (2) to match the speeds of two or more operations, (3) to hold constant speed under changing load, (4) to provide smooth, rapid, constant-current acceleration, and (5) to provide fast stops with dynamic braking. Some of the many applications include:

milling machines
propeller-governor testers
grinders
magneto testers
tensile testing machines
welder-carriage drives
reel drives
winch drives
tool-room lathes
conveyors
reversing-table drives
thread-making machines
drill presses
tire-tread machines
boring mills
alternator sets
automatic-screw machine
pump drives
superfinishes
weld positioners

HOW THY-MO-TROL WORKS

A Thy-mo-trol drive system employs electronic rectifying tubes for converting a-c power to d-c power. These "valves" or thyratron tubes supply the power to the drive motor. By properly controlling the grids of these tubes, the current or power is varied, thus effecting highly accurate control of drive-motor speed and torque.

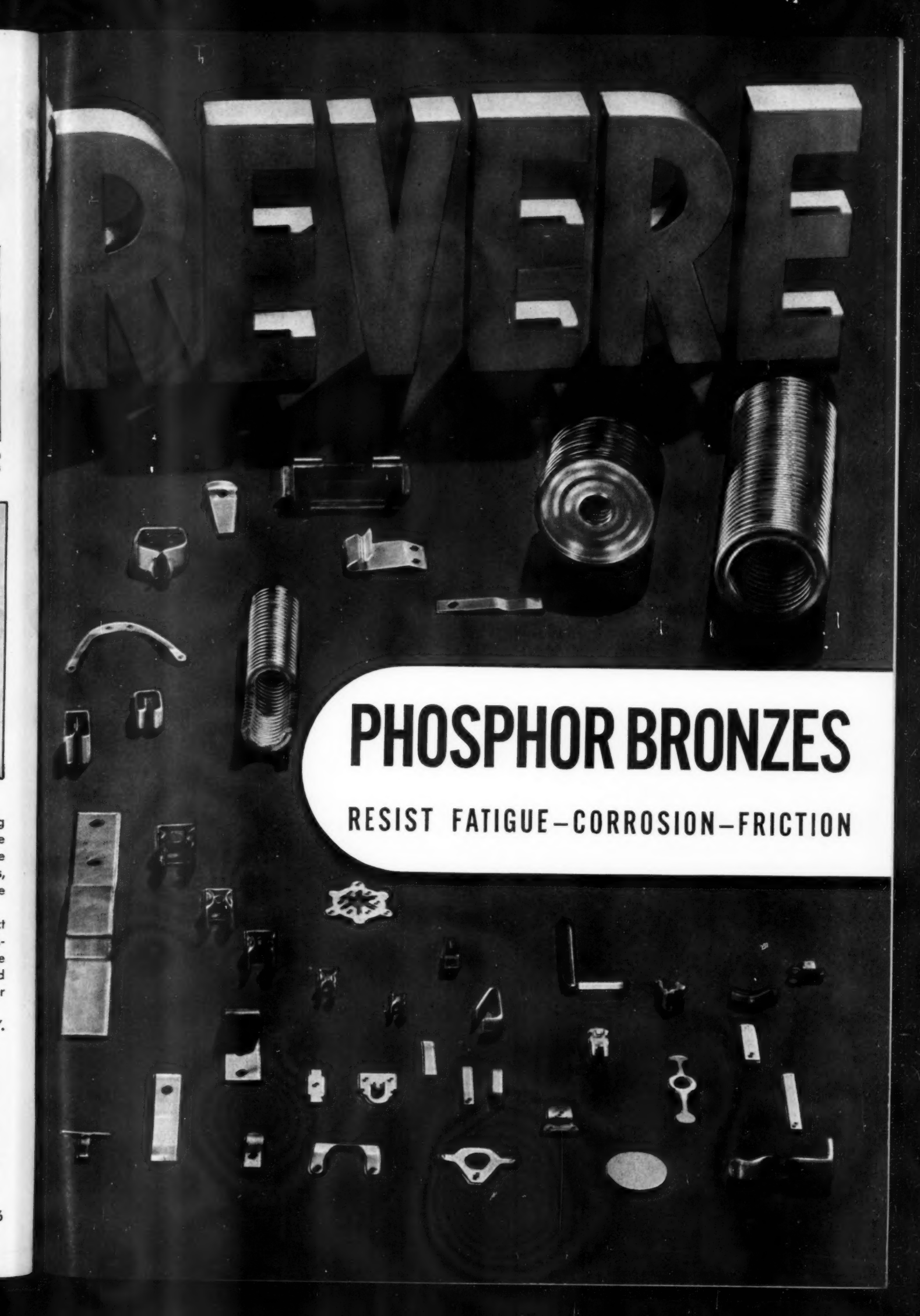
A standard Thy-mo-trol drive consists of four compact units—d-c drive motor, electronic panel, power transformer, and control station. Drives rated ⅛ to 25 hp are now available. Larger or smaller ratings can be furnished on request. For complete operating details, send for Bulletin GEA-4025.

Apparatus Dept., General Electric Co., Schenectady 5, N. Y.

GENERAL ELECTRIC

THY-MO-TROL DRIVE

670-194


REVERE
PHOSPHOR BRONZES
RESIST FATIGUE–CORROSION–FRICTION

UNIQUE ADVANTAGES OF REVERE PHOSPHOR BRONZES

True Bronze. Revere Phosphor Bronzes are true tin bronzes, containing from 1¼% to 10% tin. The phosphorous content is a mere trace, not over .05%. Phosphorous is used as a deoxidant during alloying, to prevent the formation of oxide films at grain boundaries. The absence of such films permits the material to be used at its maximum strength and fatigue resistance.

High Strength. Tensile strengths up to 133,000 psi. are obtainable, and yield strengths of 70,000 psi. or higher.

Fatigue Resistance. The combination of careful manufacturing methods with correct analysis gives Revere Phosphor Bronzes endurance limits remarkable among metals. Phosphor Bronze parts retain their dimensions, elasticity, or "springiness" through many millions of stress reversals. Grade C, 8% phosphor bronze, for example, should stand over 100 million reversals at 25,000 psi. See chart.

Coefficient of Friction. Low. Resists galling. Excellent materials for bearings, bearing plates, and shafts.

Resists Corrosion. Revere Phosphor Bronzes are comparable to copper and copper-silicon alloys in corrosion-resistance. They are highly resistant to a great variety of corrosive conditions and chemicals, and are practically immune to season cracking or stress corrosion.

Electrical. Depending upon the grade, phosphor bronzes have electrical conductivities from 11 to 43% I.A.C.S., at 20°C. They are largely employed in switches and contacts requiring heavy pressures, and are much less affected by arcing than are alloys containing zinc. They are non-magnetic.

Easy Workability. Phosphor bronzes are easily fabricated by the usual processes of punching, stamping, drawing, machining, and so on. In the fully annealed state they are extremely ductile.

Four Grades. See table. These grades offer a variety of characteristics, enabling selection of the correct material for various uses. In general, Grades A and C are used for springs, diaphragms, bellows, fuse clips, lock washers, clutch discs, and similar applications requiring high fatigue resistance. Grade D is selected where the highest strength and spring qualities are required. Grade E is principally used in heavy bars and plates to withstand severe compression, wear and corrosion. Grades A and D are also used in welding rod.

Cost Reduction. If you are now employing some other material, investigate phosphor bronzes, as they may be cheaper while providing equal if not better service. On the other hand, if you are now using a less expensive material, such as spring brass, the greatly superior qualities of phosphor bronzes may make them cheaper in the long run.

Cooperation. Revere Technical Advisors will gladly work with your engineers and designers in determining the best ways to use phosphor bronzes. Such collaboration may at times be extremely valuable, since some of the factors involved in correct design may seem illogical. For example, contact pressure depends upon thickness, not temper. Increasing the temper does not increase pressure, but permits larger deflection without permanent set, and so does decreased thickness. Careful balancing of temper and thickness are essential for best results. Revere really knows phosphor bronzes, and it will pay you to write Revere when considering their use.

TYPICAL APPLICATIONS

Fuse Clips — Contacts — Radio Trimmers — Springs — Diaphragms — Pressure Plates — Bellows — Flexible Hose — Latches — Relay Parts — Bearing Plates — Sliders — Electric Lamp and Radio Tube Sockets — Clutch Plates — Thrust Washers — Grease Retainers — Paper Mill, Oil Well, Textile, Leather, Laundry, Pump, Printing, Refrigeration, Marine, Automotive Parts and Machines.

Wherever these qualities are needed in a non-ferrous metal: Strength, Resilience, Fatigue Resistance, Corrosion Resistance, Low Coefficient of Friction, Easy Workability.

AVAILABLE FORMS

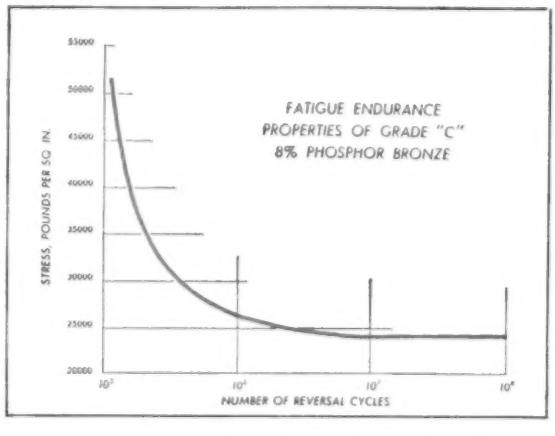
Grade A: Sheet, Strip, Plate, Rod, Welding Rod
Grade C: Sheet, Strip, Plate
Grade D: Sheet, Strip, Plate, Welding Rod
Grade E: Strip, Plate

in customary or special shapes, sizes, tempers and finishes.

PHYSICAL PROPERTIES—PHOSPHOR BRONZES

	Tensile Strength Lb. per Sq. in.		Yield Strength‡ Lb. per Sq. in. (Nominal)		Rockwell "B" Hardness		Endurance Limit Lbs. per Sq. in	
Grade	Hard*	Soft	Hard	Soft	Hard	Soft	Hard	Soft
"A" 5%	91,000-105,000	40,000-55,000	65,000	18,000	88-96	0-50	22,000	14,000
"C" 8%	105,000-118,500	53,000-67,000	68,000	24,000	95-102	20-70	25,000	21,000
"D" 10%	115,000-129,000	58,000-73,000	70,000	28,000	98-104	25-75	27,000	23,000
"E" under 4%	65,000 (Nominal)	40,000 (Nominal)	50,000	14,000	75 (Nominal)	5	18,000 (Estimated)	13,000

*Spring temper or 8 Nos. Hard ‡.5% extension under load



REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.

Sales Offices in Principal Cities, Distributors Everywhere

Another Picture of Extreme Accuracy Achieved on TIMKEN BEARINGS

The Springfield Machine Tool Company of Springfield, Ohio, and other leaders in the machine tool industry know that extreme accuracy is assured in their equipment when the spindles are mounted on Timken Tapered Roller Bearings.

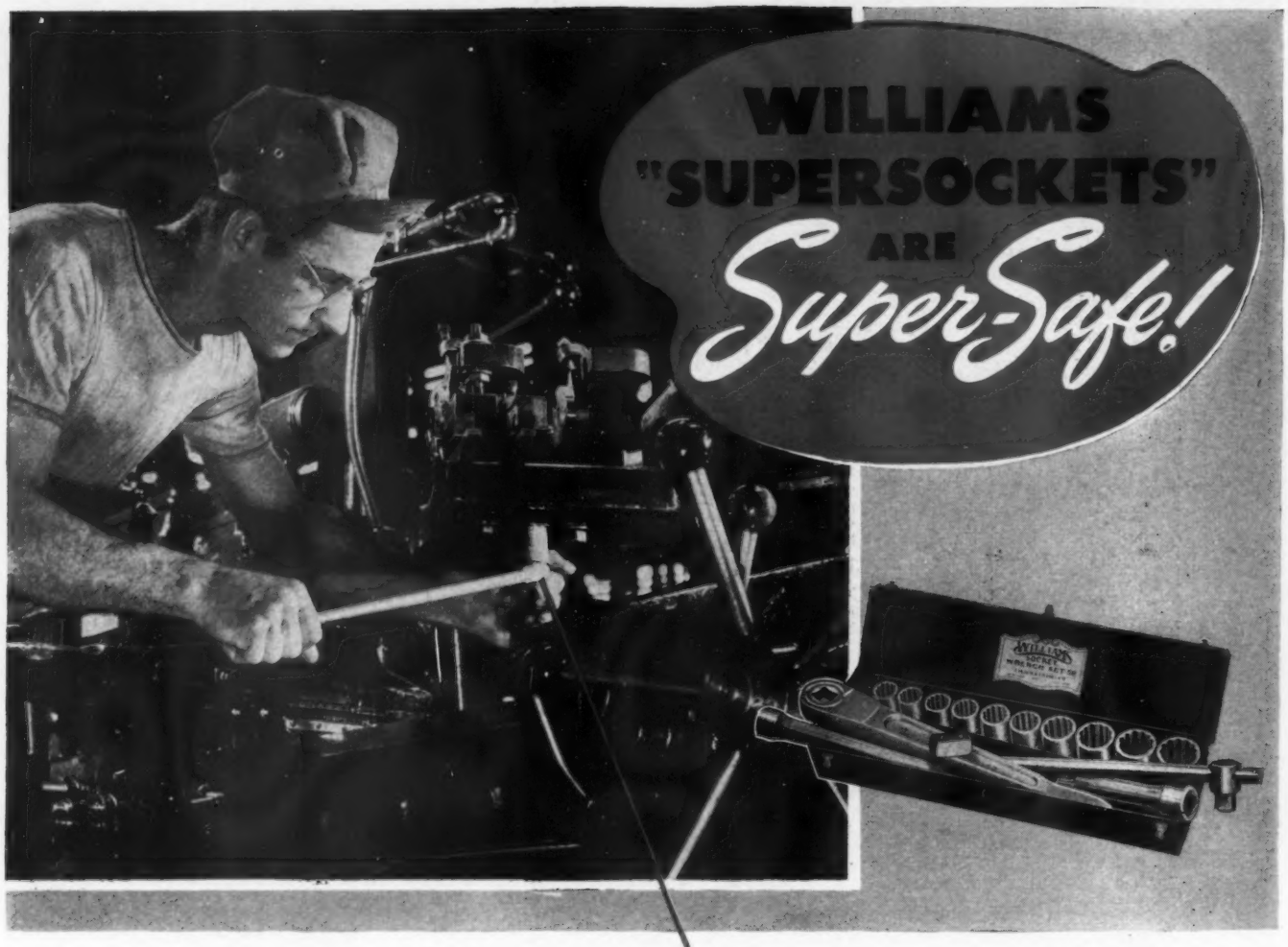
Unquestioned accuracy is obtained in the 20" Springfield Super Duty Engine Lathe pictured above because the spindle is mounted on Timken Tapered Roller Bearings thus keeping it in correct and constant alignment while controlling radial, thrust and combined loads under all operating speeds, feeds and tool pressures.

Timken Bearing Equipped machine tools can be depended upon to have power and increase endurance while assuring high productive capacity at low maintenance cost.

To make sure you are getting these profit-making advantages, specify Timken Bearing Equipped spindles in your machine tools. Look for the trade-mark "TIMKEN" on every bearing you buy. The Timken Roller Bearing Company, Canton 6, Ohio.

48 Years of Engineering and Metallurgical development.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



● No type of wrench offers a surer grip than Williams "Supersockets." This operator knows his wrench can't slip although he is unable to see the cap screw he is loosening. He knows he can apply a hard pull without danger of battered hands or more serious injury. He's a safe and efficient worker because he has safe and efficient tools!

And super-safety is only one feature of Williams "Supersockets." With their endless combinations of handles, accessory parts and sockets, they provide industry's most flexible wrench system. Made in five patterns, with drives from 1/4" to 1" square. Sold by leading Industrial Distributors everywhere.

J. H. WILLIAMS & CO., BUFFALO 7, N. Y.

WILLIAMS

DROP-FORGINGS AND DROP-FORGED TOOLS

PUT THE HEAT ON THOUSANDS OF JOBS...

With Fast, Precise

ELECTRONIC HEATING

ELECTRONIC HEATERS

ANNEALING

100,000 THUMBSCREWS PER DAY

BRAZING

2,000 ELBOWS PER HOUR

HARDENING

ONE GEAR EVERY 4 SECONDS

SOLDERING

900 CAPACITORS PER HOUR

● Literally thousands of localized heat applications to practically any metal—steel, copper, brass, nickel—are possible with G-E Electronic Induction Heaters. Case histories have repeatedly shown that you can harden, anneal, braze or solder at lower cost—and in a fraction of the time required by other methods.

G-E Electronic Heaters consistently assure uniform, high-quality output in heat-treating operations. The applied heat is localized to the *exact* area to be processed, and close control of both the time and intensity of heating is made possible.

Investigate how you may obtain the advantages of fast production, versatility, low cost, and uniform high-quality in your heat-treating operations by consulting the Heating Specialist in a G-E Office near you. His recommendations are based upon experience gained in hundreds of installations, plus almost half a century in the development, manufacture and application of all types of electric heating equipment. Or, write, ***Apparatus Department, General Electric Company, Schenectady 5, N. Y.***

Typical Applications

To meet individual production requirements, such as these, covering a wide range of heat-treating operations, G-E Electronic Induction Heaters are used with G-E-designed and -built, manual and automatic parts-handling equipment.

GENERAL ELECTRIC

675-139-8744

FLEXIBILITY . . . SPEED . . . ACCURACY

You get them all in a

FOSDICK

JIG BORER

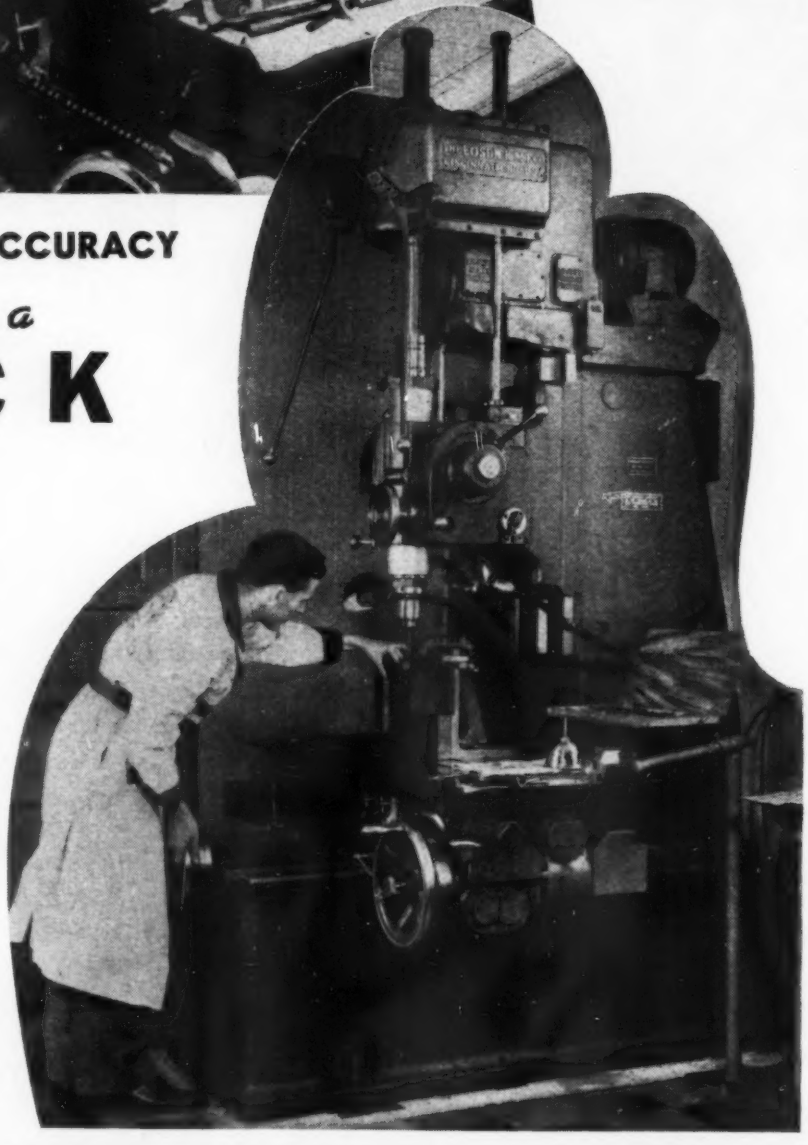
● Flexibility is made possible by twelve speeds from 60 to 1,500 R.P.M.—feed range from .00125" to .010" and table with horizontal and longitudinal adjustments which provide for handling a wide range of work.

Simplicity of control and ease of set-up makes for speed of operation and minimum of set-up time.

Accuracy is assured by rugged design of bed—knee—table and sliding head which gives support to spindle close to the work.

Costs are low too, because of the precision work that can be run without the use of expensive jigs or fixtures.

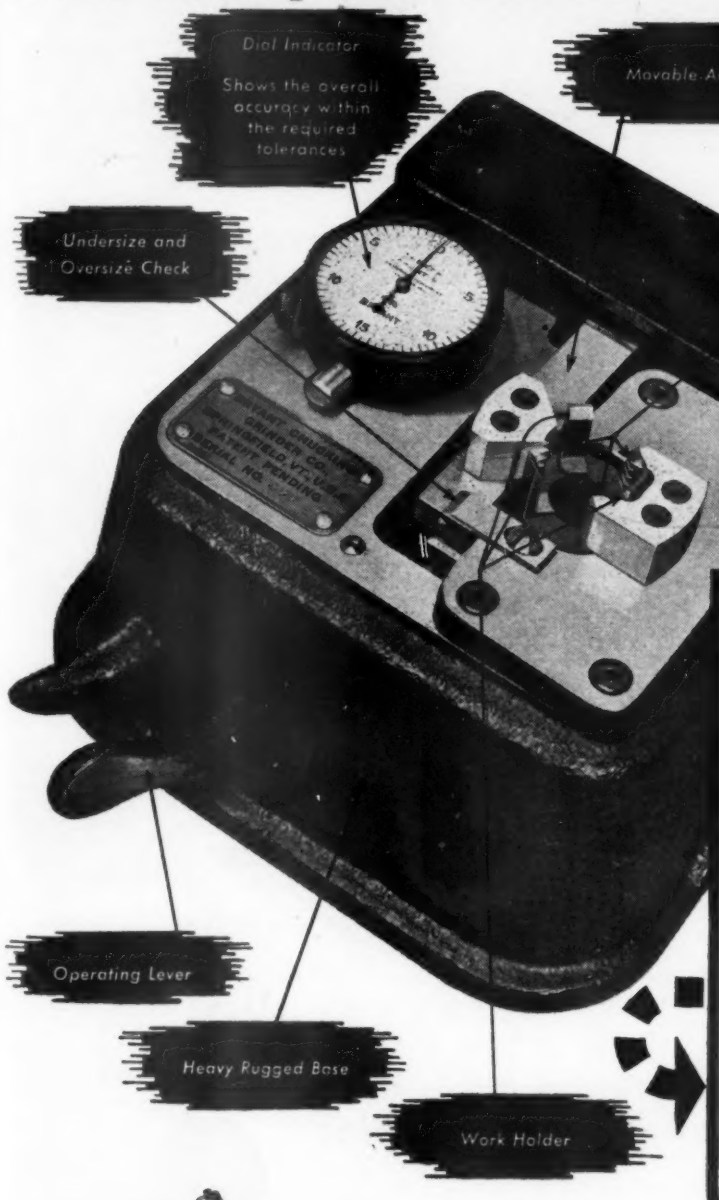
Full details contained in Fosdick Jig Borer Bulletin J.B.A. Ask for one.



FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

Bryant Thread Gages

. . . An Entirely NEW PRINCIPLE in the Field of Thread Inspection


Dial Indicator
Shows the overall accuracy within the required tolerances
Movable Arm
Thread Segments
Three-point contact, with two points stationary and one movable, is the key to the speed with which gage is operated.
Undersize and Oversize Check
Operating Lever
Heavy Rugged Base
Work Holder

ANYONE who can *push* a lever, *drop* a part, and *read* a large dial gage, *can inspect threads* to any desired degree of accuracy on Bryant Thread Gages. That's how easy it is. There's no slow and tiresome threading of plug and ring gages into and onto the work. There's no "feeling" for the class of fit.

Combined with this ease of operation is *speed*. The Bryant Method is *four or five times faster* than plug or ring gaging. Because the method is so simple, this speed is attained by inexperienced operators *on the first day*.

Speed us the coupon for complete details.

Please send me Catalog No. G3 which gives complete details on the Bryant Thread Gages.

Name_____ Title_____

Company_____

Street_____

City_____ State_____

NEW PORTABLE THREAD GAGES

and Squareness of Face Gages, Universal Hole Size Gages, Both Internal and External.

BRYANT

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

Automatic Precision

. . . beyond human skill with push-button control

The Model 3-B JIGMIL

PROVIDES accuracy beyond human skill by push button control.

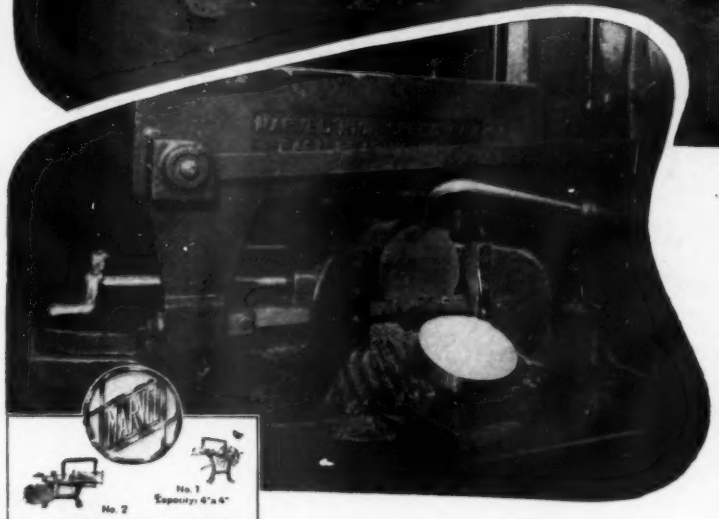
Automatic positioning between holes is controlled to within less than one ten-thousandth part of an inch.

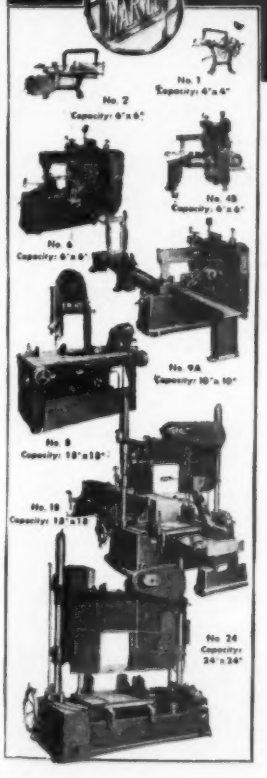
Retraction and repositioning of the work for measuring or tool changing is by push button operation.

Any function is responsive to this centralized finger tip control.

The World's Finest BORING and Milling Machine

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**





No "waiting" cost here!

There are no costly delays, no men and machines standing idle, waiting for stock to be cut off from bars, when the stockroom is equipped with a No. 6A or 9A MARVEL High Speed Sawing Machine.

These *fast*, all-ball-bearing high speed saws will cut off accurate lengths or slices at almost unbelievable speed. Equipped with an automatic bar push up, they will cut identical pieces from single or nested bars automatically, with no more operator attention than an automatic screw machine. Still, at any point, the automatic operation can be interrupted, a miscellaneous cut made, and the "production" run resumed by simply re-engaging the bar feed. A single MARVEL Automatic can keep well ahead of a large machine shop, increasing the earning time on all machines.

There is a MARVEL Saw for every need—in every capacity range and price class. Your local MARVEL Sawing Engineer will gladly study your metal sawing problems and requirements and make recommendations as to methods and equipment.

Send for Catalog

ARMSTRONG-BLUM MFG. CO.

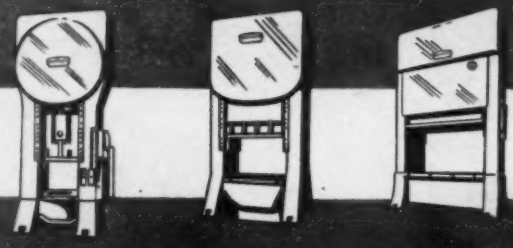
"The Hack Saw People"

5700 BLOOMINGDALE AVE. **CHICAGO 39, U.S.A.**

***Eastern Sales Office:* 225 Lafayette St., New York 12, N. Y.**

MARVEL SAWS

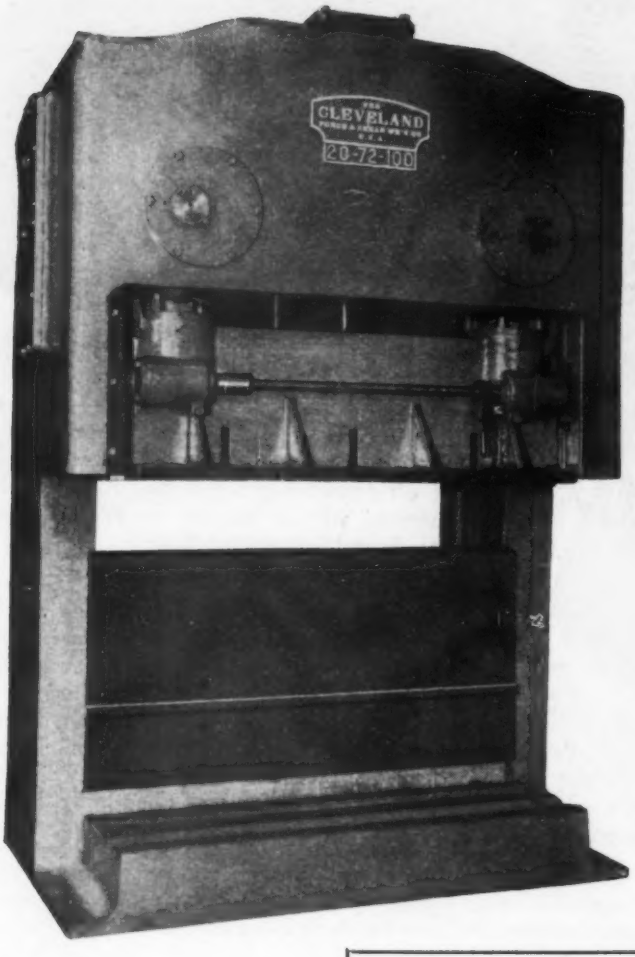
MODERN

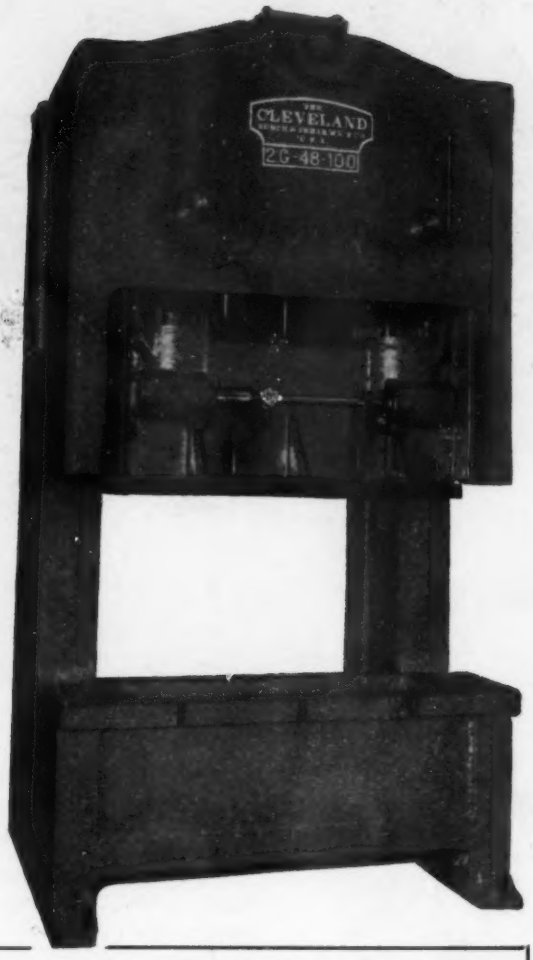


Straight-sided Presses

and NOW—

MODERN *Two Point* GAP *Presses!*





If it's a

CLEVELAND

it's modern!

These Modern Two Point Open Back Gap Presses have been developed along the lines of our Modern Straight Sided Presses, with the gears, flywheel and drive unit located in the box type crown.

This design not only eliminates all overhanging brackets and other projections but it also provides more ruggedness and greater accuracy to the machine, as well as saving valuable floor space.

The 2G-72-100 Press, which has the lower section of the bed cut back, has a stroke of 10", adjustment 4", capacity 100 tons and operates at 35 strokes per minute.

The 2G-48-100 Press has a stroke of 8", adjustment 4", shut height—24", capacity 100 tons and operates at 35 strokes per minute.

Both of these Modern Cleveland Presses are equipped with an electrically controlled, hydraulically operated friction clutch but an air operated friction clutch can be furnished, if desired.

THE CLEVELAND PUNCH & SHEAR WORKS COMPANY *Cleveland, O.*

New York • Chicago • Detroit • Philadelphia • Pittsburgh

DIVERSIFIED ?

XLO

EX-CELL-O *for* PRECISION

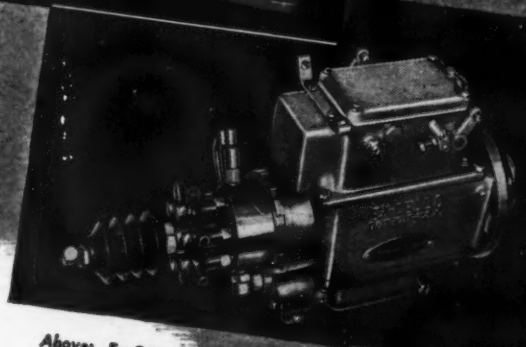
Above: Ex-Cell-O Pure-Pak Machine for packaging milk in paper—this new Senior machine (one of five models) forms the containers; sterilizes them inside and out, cools them, fills, seals and dates them—all in one continuous, automatic operation in the dairy. Pure-Pak containers for dairy products are now being used at the rate of more than one billion containers a year.

To Right: Ex-Cell-O engineering services and precision machines are being used by many American industries for the mass production of accurately-made parts and sub-assemblies. Shown is Ex-Cell-O special machine for [illegible] reaming 18 holes and drilling 36 holes in a magnesium crankcase.

. . . the pioneering spirit at Ex-Cell-O remains undaunted!

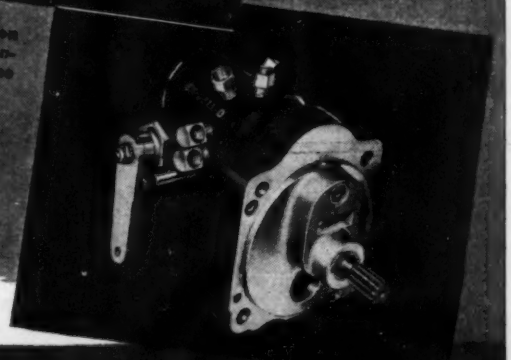
. . . an opportunity to reaffirm our company's allegiance to the pioneering spirit that brought it into existence. It is a spirit that maintained Ex-Cell-O unfailingly during the economic extremes of the twenties and the thirties, and that enabled the company, during the early forties, to make a worthwhile contribution to our nation's war effort. I can say in all sincerity that the same spirit impels the whole Ex-Cell-O organization of today . . . a clear assurance of the active role that Ex-Cell-O will play in the peacetime years immediately ahead.*

**from a message by Phil Huber, President and General Manager of Ex-Cell-O Corporation, on the occasion of the company's 25th Anniversary . . . as timely and significant now as when given in 1944.*



Above: Ex-Cell-O Fuel Injection Pumps—for high speed DIESEL engines in the automotive, marine and industrial fields.

To Right: Ex-Cell-O GASOLINE Injection System for aircraft engines—the advantages of gasoline injection make flying safer, easier and more economical and enjoyable.



EX-CELL-O

CORPORATION • DETROIT

Manufacturers of Pure-Pak Paper Milk Bottle Machines, Aircraft and Miscellaneous Production Parts, Precision Machine Tools and Equipment, Continental Cutting Tools, Fuel Injection Equipment, Railroad Detail, and Drill Jig Bushings.

An Airline Operator Said to an Aircraft Builder,

"I see the plans for your new transport call for the use of many magnesium parts.

That is good. Every pound of dead weight you save means additional earning power of $100 per plane, per year."

Millions of miles of flying taught that man the value of eliminating excess weight. That same experience proved to him the economy of saving that weight by employing magnesium everywhere possible.

In other industries operators have learned the same thing: It pays to employ magnesium to reduce the weight of moving parts and products that must be moved. Jobs go faster and costs come down.

American Magnesium products provide the means for accomplishing this weight saving—sand castings, permanent mold and die castings, shapes, sheet and plate. Our engineers will help you incorporate them in your designs.

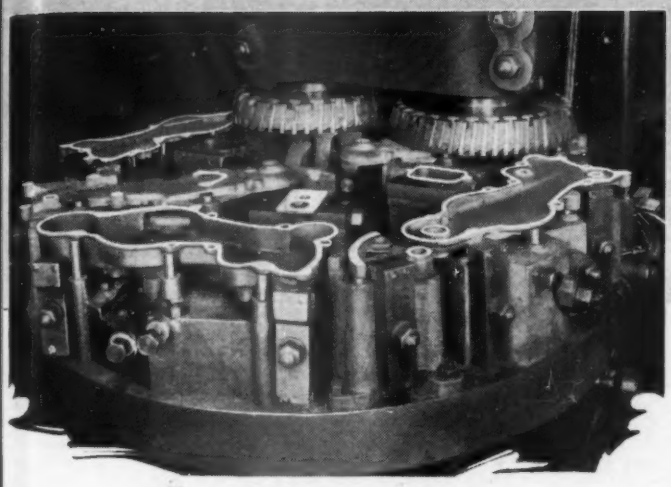
For this help, get in touch with the nearby Alcoa office. Or write Aluminum Company of America, Sales Agent for American Magnesium products, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

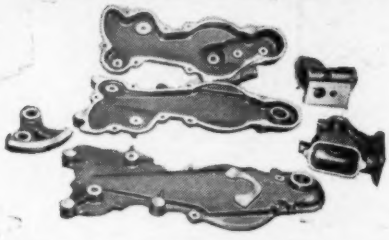
MAGNESIUM MAZLO PRODUCTS

REG. U.S. PAT. OFF.

AMERICAN MAGNESIUM CORPORATION
SUBSIDIARY OF
ALUMINUM COMPANY OF AMERICA

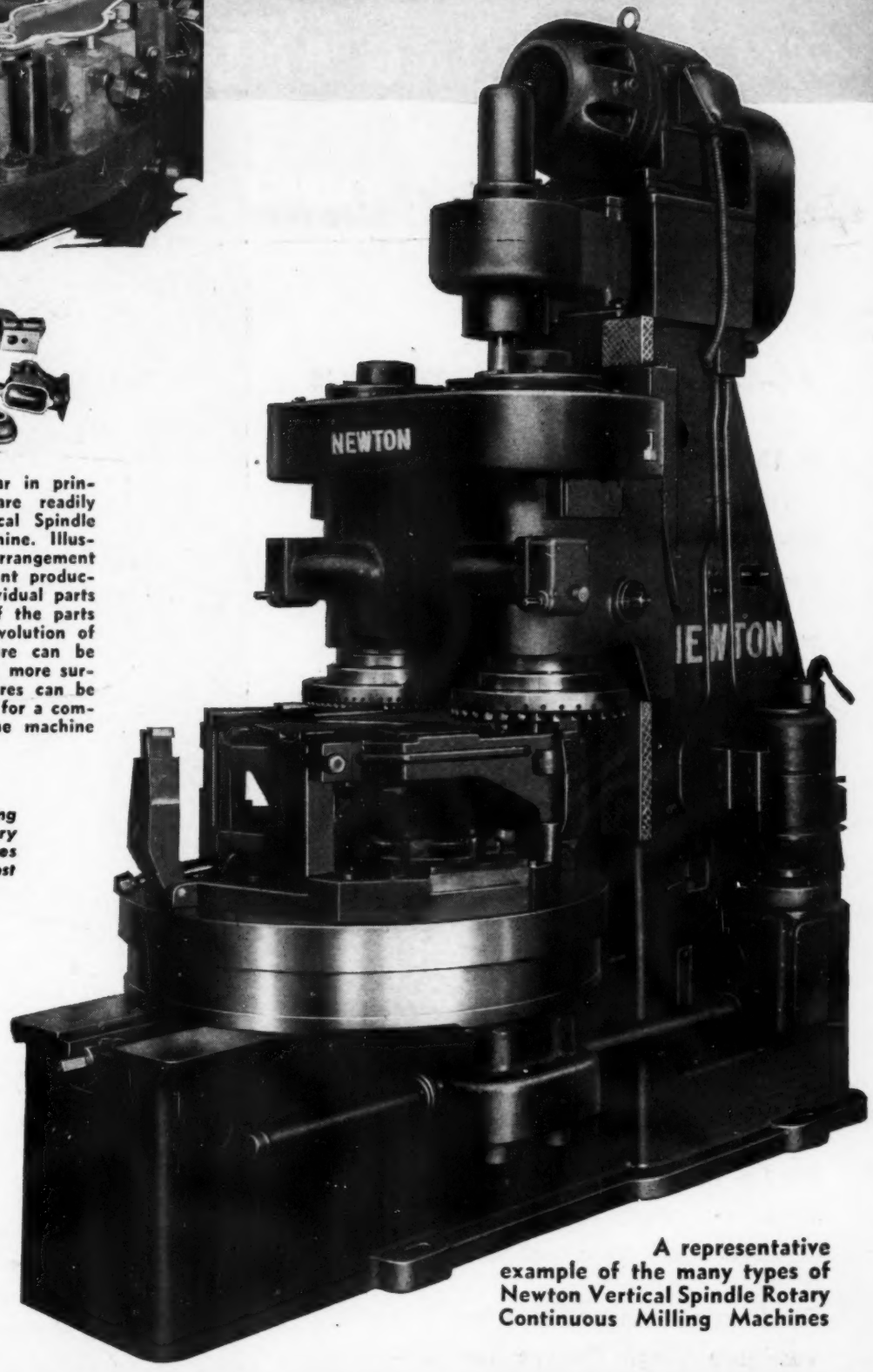
Let one machine with one operator do the work of several





Work-piece arrangements, similar in principle to that shown above, are readily handled on any Newton Vertical Spindle Rotary Continuous Milling Machine. Illustrated here is a fixture arrangement especially adapted to smaller plant production where the quantity of individual parts to be finished is limited. All of the parts shown can be milled at one revolution of the table. Similarly, the fixture can be arranged to accommodate two or more surfaces of the same piece. Fixtures can be arranged to mill all parts needed for a complete assembly, thus keeping the machine in continuous production.

Complete information covering Newton Vertical Spindle Rotary Continuous Milling Machines will be furnished upon request



A representative example of the many types of Newton Vertical Spindle Rotary Continuous Milling Machines

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1861

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

KING offers complete range of sizes for BORING AND TURNING WORK

From 30" Single Column to 144" Double Column

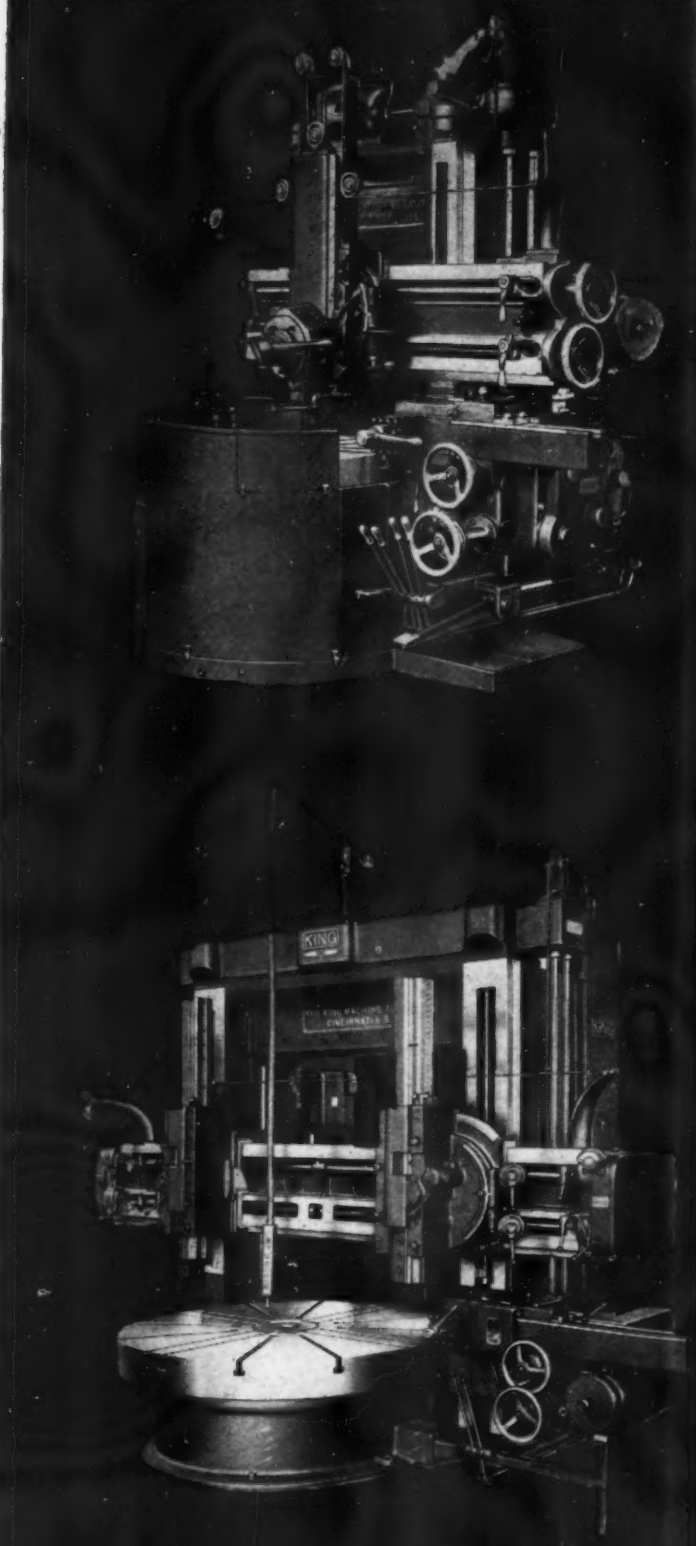
● The wide range of general purpose Vertical Boring and Turning Machines offered by KING enables you to select the size and type best fitted to your needs.

The recently announced new KING as shown in the double column illustration provides complete accessibility of all controls—a ten per cent increase in weight—new, powerful ram heads—a wide range of feeds and speeds—and many other improvements for cutting costs on your boring, turning and facing operations.

The complete line is of heavy design and rigid construction making them especially suited to the efficient and economical use of carbide tools.

King is recognized in the field as largest exclusive manufacturers of general purpose Vertical Boring and Turning Machines.

For long service and low maintenance investigate King. They're heavier—faster—have greater rigidity.



THE KING MACHINE TOOL COMPANY
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

Now! LIFT, MOVE, STACK Materials Electrically with NEW TRANSTACKER

PRICED AT ONLY **$1800** (Some Models Slightly Higher)

PLATFORM TYPE TRANSTACKER

Capacity 4000 pounds

For stacking unit loads on skid platforms.

Above price applies in U.S. only.

Low price brings modern material handling methods within reach of all!

NOW for the first time every business—every industry can use modern, money-saving material handling methods at new low cost.

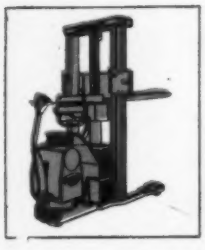
Because in the new Transtacker, Automatic's engineers have developed a high-lift stacker that sells for as low as $1800. And while it will move, lift and stack up to 4000 pounds, it weighs only 1900 pounds. This means you can safely use Transtacker, even if your floor and elevator capacities are limited.

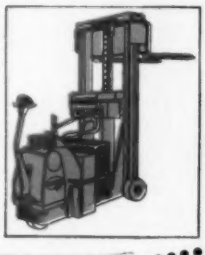
With all the advantages of the famed Transporter that moves any kind of material with amazing "touch-of-your-thumb" ease, Transtacker now gives you an electric hydraulic lift that stacks your product at new heights to increase storage capacity. With finger-tip control it lifts up to 4000 pound loads in a matter of seconds . . . smooth, controlled lowering speed for utmost safety. Mail coupon for facts.

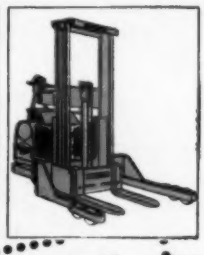
OPEN FACE PALLET TYPE TRANSTACKER—Capacity 3000 pounds—With suitable forks for stacking open face pallet loads.

SUSPENDED LOAD TYPE PALLET TRANSTACKER—Capacity 2500 pounds—With suitable forks for stacking double or open face pallets.

STRADDLE TYPE PALLET TRANSTACKER—Capacity 4000 pounds—With suitable forks for stacking double face or open face pallet loads.

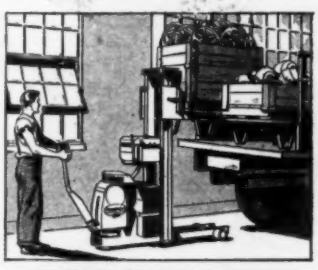






FINGER TIP CONTROLS LOAD

Cartons, crated goods, hard-to-handle material—one man or girl hauls, lifts and stacks to full storage heights.



ENORMOUS SAVINGS IN SHIPPING

Pick up merchandise from ground level and deposit it on truck or trailer. A three-man operation becomes a one-man operation.

PRE-TESTED IN INDUSTRY

1 Cuts loading and unloading time in half.

2 One man does the work of three with less effort—Transtacker cuts handling costs up to 60%.

3 Light in weight for limited floor and elevator load capacity.

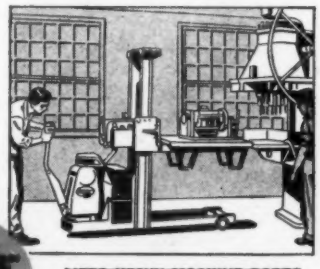
4 Hauls any kind of product with "touch-of-thumb" ease.

5 Gives you extra storage space without added cost.

6 Lifts and stacks product from ground level to trucks and trailers.

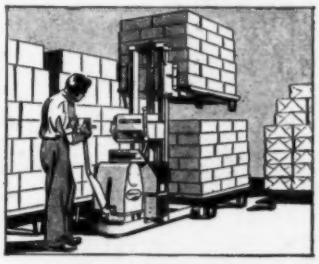
LOOK TO THE LEADER FOR ALL THAT'S NEW!

Transtacker
A PRODUCT OF AUTOMATIC
Lightens LIFE'S LOADS



LIFTS HEAVY MACHINE PARTS

When heavy machine parts must be lifted to working height, let Transtacker safely lift it and place it.



ENDS BACK-BREAKING HANDLING

This can be *your* trucker—easily, efficiently stacking your material with Transtacker. Extra storage space is yours free.

AUTOMATIC TRANSPORTATION COMPANY
DIV. OF THE YALE & TOWNE MFG. CO.
39 West 87th St., Dept. P. Chicago 20, Illinois

Please mail me without cost or obligation, complete facts about the NEW TRANSTACKER.

( ) Have an A.T.C. Specialist call and survey my material handling costs.

Company Name.....

By.....*Position*.....

Street Address.....

City.....*State*.....

LOCK JAW *Stops*

SLIDING

HEAVING

SHIMMYING

CHATTERING.

YAWING

BUCKLING

HANDY *New All-Purpose* CLAMP

Eliminates expensive clamping and bolting operations. No more hunting around the shop for straps, bolts, washers, nuts or scrap pieces to wedge or lock your work in position. No oddly and awkwardly contrived, odd-sized and makeshift locks, limited in their ability to wedge and hold.

Now LOCKJAW gives you positive, powerful two-way locking, sure grip pressure downwards and side-ways. It may be set at any angle on the table and held by the T-slot bolt. Then LOCKJAW pressure is applied to one or more pieces of stock by simply adjusting Capstan Jack Screw.

Setting up or taking down is a quick and simple operation. Every machine shop, tool room, or metal working unit can find many handy uses for this new Rivett conceived clamp on their planers, radial drills, shapers, milling machines, surface grinders and boring mills.

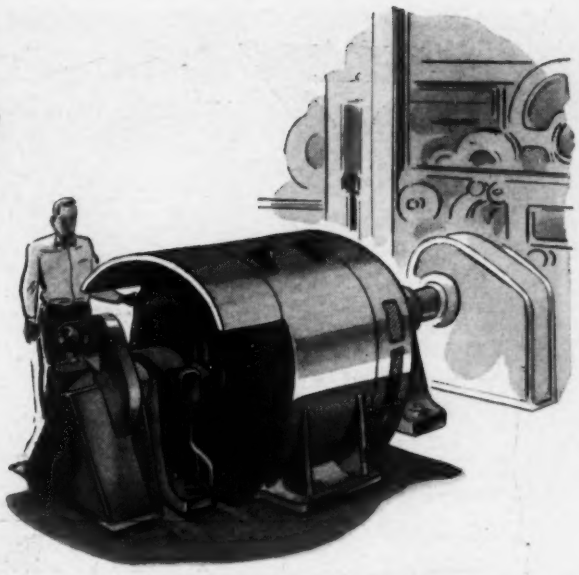
You, too, will save time, trouble and inconvenience when you use LOCKJAW to eliminate cumbersome and awkward clamping.

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

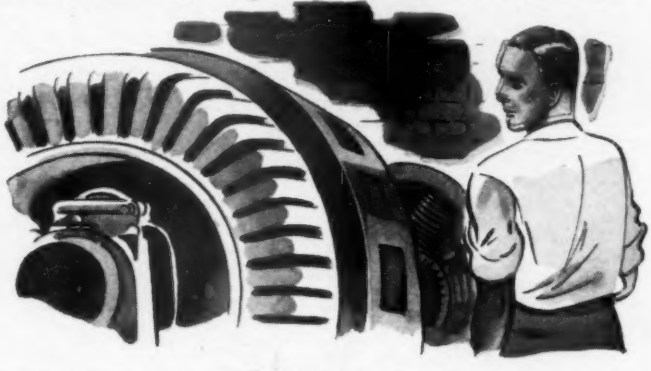
"What! Stop a 30" Calender Roll in Less than 14" of Roll Travel!"



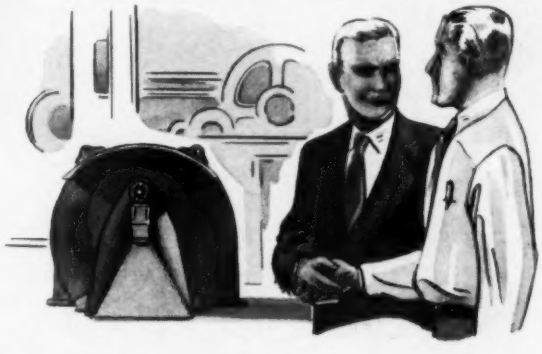
"Right! And besides that emergency stop, give us 10 to 1 speed range on the motor and hold speed *close*. The torque characteristic of our calender requires that the motor have high overload capacity at low speeds without overheating. And because of operating conditions, we want sparkless commutation too!"

B-b-u-t-t... "No buts" said Mr. Rubber Mill Man, "that's *exactly* what we need. You see, we're experimenting with new materials on our rolls, and since we can't *pre*-determine best roll speeds for them, we must have a drive that'll give us complete *range* of speeds, and at the same time, complete *protection* for our workers".

"In A Nutshell, you and the control engineers must design a calender drive system that'll give us *higher* and *lower* calender speeds, *closer* speed regulation and *sudden* emergency stopping —*"all three!"* Well, we set up meetings between the control and motor designers to plan a *coordinated* design that would meet the needs.



An Automatic Speed Control incorporating both our m-g set and "Regulex" exciter was designed to hold selected speed within close limits. And, after a careful analysis of required load characteristics, we designed a 400 hp d-c motor of low inertia for quick stopping . . . and which also provided speed range from 25 to 250 rpm.



Remember That 14" Stop? After the system went in, we stopped the rolls first at 18" . . . easy. Then at 14" . . . at 12" . . . at 9"! And we probably would have stopped 'em even shorter but for possible danger of too sudden stops to the calender gear system. And commutation? After 6 months, the operators say it's perfect. A 2048

Moral: Every time Allis-Chalmers discovers new ways of solving *special* motor problems, like this one, it also learns how to build better *standard* motors for you! Watch for these new and better motors from A-C. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

Wait 'til you see the NEW

ALLIS-CHALMERS MOTORS!

57 YEARS OF SPECIALIZED EXPERIENCE at Your Disposal

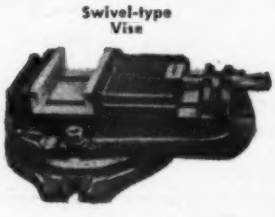
Back of every Kempsmith Milling Machine and Milling Attachment is a rich heritage of more than 57 years of specialized experience, building better milling machines and attachments, exclusively. This is your guarantee of precision workmanship, plus rugged, enduring construction.

Circular Milling Table

Vertical Head Attachment

Slotting Attachment

Hi-Speed Universal Attachment


Swivel-type Vise

Style B Arbor

Let an experienced Kempsmith Engineer show you how to broaden the scope of your standard milling machines with Kempsmith Standard Attachments. It involves no obligation to purchase, and it may materially reduce your milling costs. Write today for literature.

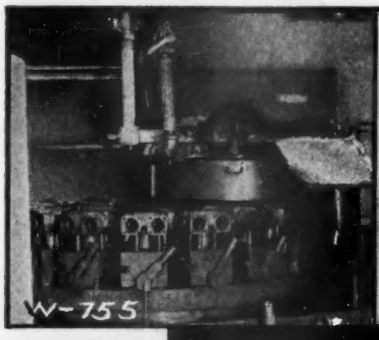
THE KEMPSMITH MACHINE COMPANY • MILWAUKEE 14, WIS., U. S. A.

KEMPSMITH

Precision Built Milling Machines Since 1888

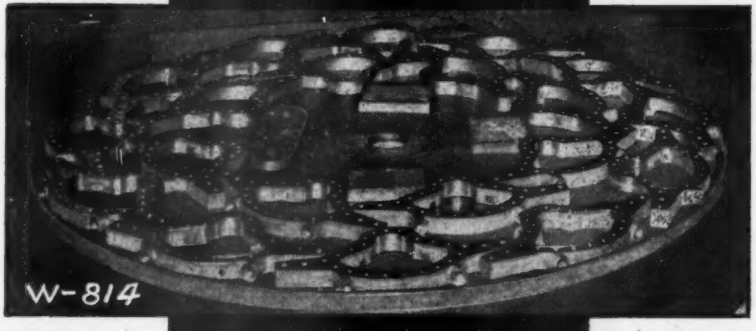
A5033-IP-C

FOR CLOSE LIMITS-*Blanchardize*



The Blanchard No. 18 Surface Grinder is used to rough and finish-grind these oil burner parts, and .012″ of stock is ground off one side to limits of +.0003″ −.0001″. (48 per hour)

Eighteen of these cast iron ball bearing spacers, with eighteen smaller spacers inside of them are ground to limits of .0002″ after removing .025″ of stock. (144 surfaces per hour)



This is an excellent example of accurate surface grinding of pump body parts on a No. 18 Blanchard Surface Grinder. The material is high strength forged steel and .004″ of stock is removed from each side to limits of ±.0003″. (80 surfaces per hour)

These heat-treated steel trunnion bearings are ground on a No. 16-A2 Blanchard Surface Grinder. They are ground to limits of ±.0005″ after removing .005″ to .015″ of stock. (2315 per hour)

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

890 . . . another "PLUS-PRODUCTION" MARATHON Lubricant

Cut inventory . . . use one outstanding oil for more cutting jobs . . . MARATHON 890 Cutting Oil

USE "as is." No mixing or blending required. Marathon 890 Cutting Oil is correctly compounded, when it comes to you, to take on the bulk of cutting jobs in large production plants as well as varied work in small shop operations.

Light in color so that the operator can see the work piece through the oil film. Just the right viscosity for flowing freely on the job and through the circulating system. Absorbs and dissipates heat rapidly, reduces smoke to a minimum or eliminates it entirely . . . and gives longer tool life and better finish. No objectionable odor. No gumming. Economical without sacrifice of performance characteristics.

An Ohio Oil Company lubrication engineer will be glad to point out the advantages of this versatile, multiple-job cutting fluid in your operations. Just write, wire or phone.

A COMPLETE LINE OF CUTTING AND GRINDING OILS FOR EVERY METAL WORKING OPERATION

THE OHIO OIL COMPANY

GENERAL OFFICES: FINDLAY, OHIO

District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

MARATHON

PRODUCERS OF PETROLEUM SINCE 1887

ACTIONS

SPEAK LOUDER

The proof of the puddin' on any piece of equipment rests on its performance, based on everyday use under all types of working conditions.

In plants where peak production plus economical production is a "must" there you will find Hansen Push-Tite Couplings because they save operators' time, save costly air and speed up production.

In large and small plants throughout the country, first choice is predominantly Hansen Couplings and for good reasons. They are simple and easy to operate, save time, effort and material, and will last longer because they are compact and sturdy with all moving parts fully protected. Millions of Hansen Couplings are in daily use in thousands of plants, evidence of their superiority as the best by any test.

The simplicity and ease of operation is unique, to connect the Hansen Push-Tite Coupling you simply push plug into socket, it is locked and immediately the air is automatically turned on. No twisting or turning to lock and connect, just a slight push of plug. To disconnect, slide sleeve back with thumb, it is unlocked, disconnected and air is automatically shut off. Complete swivel action prevents kinking of hose.

Send for free industrial catalog.

HANSEN MANUFACTURING CO.

1786 E. 27 ST., CLEVELAND 14, OHIO

A VITAL COMBINATION—

ERIE Steam Hammers...

Hammergangs with years of "Know How"

HERE you merge the product of 50 years of research, design, craftsmanship in manufacture . . . Erie Hammers . . . with the alert keen-minded, quick moving Hammergang . . . To the end result of Better Forgings for the machines of industry, the transports of commerce, the prime movers of construction - This is American Teamwork at its finest . . . . . The Machine . . . The men.

Your copy of Erie bulletins on Erie Steam or Board Drop Hammers, Erie Single or Double Frame Forging Hammers or Erie Trimming Presses is available upon your request.

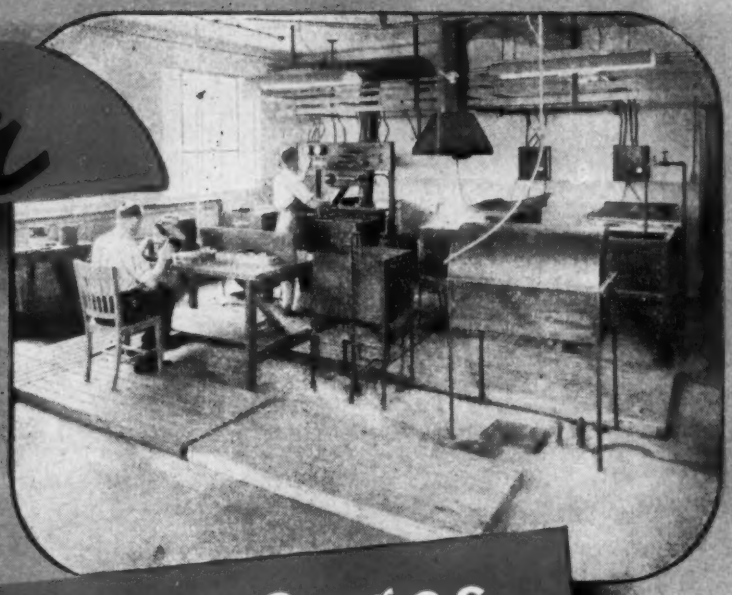
ERIE

ERIE FOUNDRY COMPANY, ERIE, PA.

ERIE BUILDS *Dependable* HAMMERS

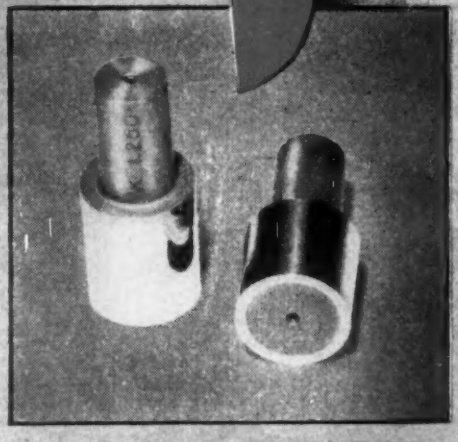
Van Keuren

PRECISION CHROMIUM PLATING

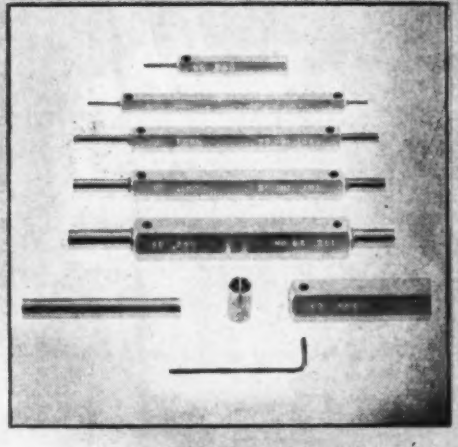


applied to Plug Gages

THE Van Keuren Co. has developed a new method of precision chromium plating of wire type and taper insert plug gages. In this modern plant we have combined the best available plating practice with the ability to make precision measurements. We are able to deposit a chromium wear surface accurate to a few millionths of an inch. Gages are finished to the low wear limit and then are plated to the high wear limit. The result is a thin, closely adhering wear surface which will not crack or peel and which is available at a very moderate cost.



Instead of paying 50 to 75% additional for chromium-plated gages, they are now available for only 25% additional and they wear 3 to 5 times as long as steel gages. The many repeat orders which we are getting from large users indicate that this new method is resulting in more prompt deliveries, greater wear, lower gage cost, and satisfied customers. For your next gaging job, specify Van Keuren chrome-plated gages.



Handbook and Catalog No. 33.

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

27th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Sine Triangles • Carboloy Plug Gages • Carboloy Measuring Wires.

Pick up your Profits with Corbin Screws

"You can reach for a Corbin Screw *blindfolded*— and get a good one every time!"

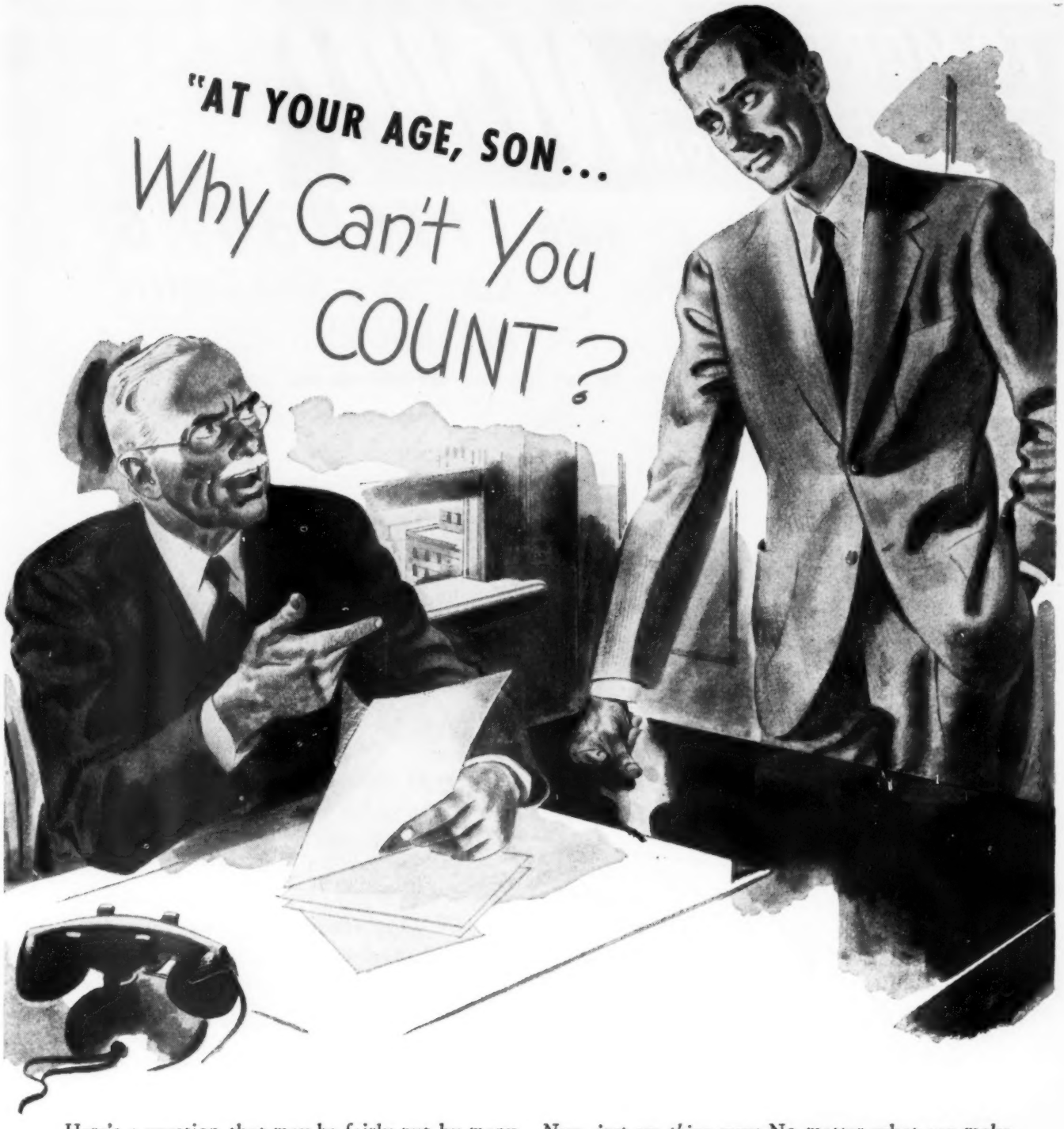
SS-1

If all screws were exactly alike you could buy 'em anywhere and use them blindfolded. But keeping screws alike calls for never-ending vigilance. Here at Corbin we change dies before they are worn. We keep our saws and cutters *sharp*, and maintain very thorough inspection.

That's why we recommend Corbin Screws — Regular Slotted or Corbin-Phillips — to any manufacturer who would like to get more assembled parts per hour.

CORBIN SCREW DIVISION
The American Hardware Corporation
NEW BRITAIN • CONNECTICUT
Warehouses:
New Britain • New York • Chicago

CORBIN
DEPENDABLE SLOTTED
Screws



Here's a question that may be fairly put by many manufacturers to products that have been out in the field, pulling their freight, for some time.

It's a small thing, but a BIG thing, as so many of these manufacturers have found.

For when a product, a machine, or a process can keep count of its own functioning, performance, or production . . . then it gives its user a much tighter rein on all lines of production. Because, you see, when a Veeder-Root Counting Device is built into a product, then that counter gives an accurate, up-to-the-minute record of that product's performance . . . shows at all times how the product stands in relation to departmental and over-all production schedules . . . shows, when the product is newly installed, that it is living up to its guarantee. This is what's meant by Veeder-Root *Count*rol . . . which means an extra usefulness, and new sales-appeal for *any* product.

Now, just one thing more: No matter what *you* make, it will profit you to investigate the possibilities of complete Veeder-Root *Count*rol. For beyond the scores of *standard* Veeder-Root Counting Devices, there are no limits to the development of *special* devices for any purpose. So *never* say your product can't count . . . until you've talked to a "Counting House" engineer. Write.

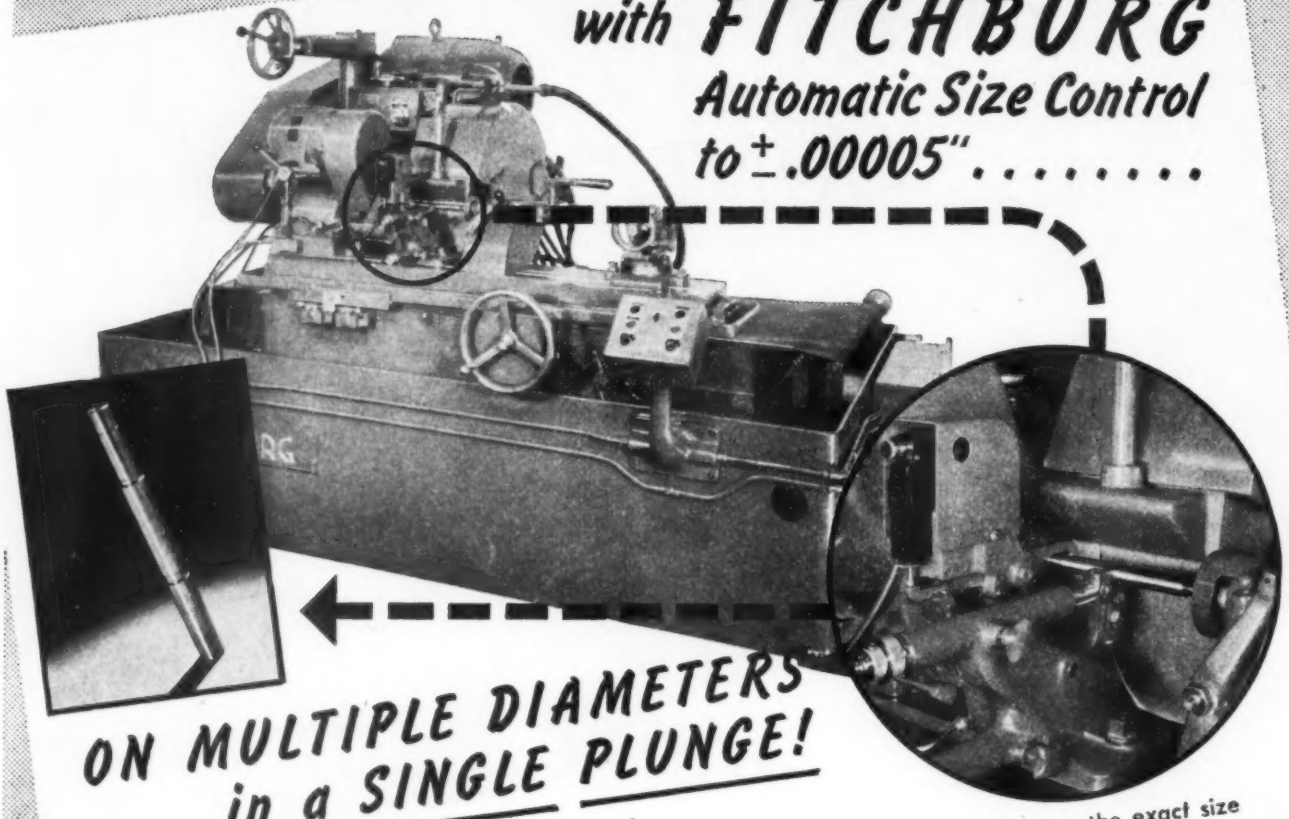
The Counting Houses of Industry

VEEDER-ROOT INC.
Hartford 2, Connecticut

In Canada: Veeder-Root of Canada, Ltd., Montreal
In England: Veeder-Root Ltd. (New address on request)

TOMORROW'S High Production NOW!

with FITCHBURG Automatic Size Control to ±.00005" . . . . . .



ON MULTIPLE DIAMETERS in a SINGLE PLUNGE!

With FITCHBURG'S Automatic Size Control and Multiple Grinding you can easily beat the steadily rising costs of operation. These combined features are exclusively Fitchburg's—no other manufacturer of cylindrical grinding equipment has them . . . because no other manufacturer has been asked by industry to create and develop so many high-production, single-purpose, cylindrical grinding machines.

The Automatic Size Control is not a dial to be operated by the operator . . . it's not a costly electronic gadget which can get out of order easily and needs an expert to maintain. It is an inexpensive, simple, mechanical arrangement employing the principle of low increment feed which goes into operation automatically at the completion of the automatic cycle Bowgage wheel feed. A push-button starts the grinding—the machine automatically stops when the exact size is reached.

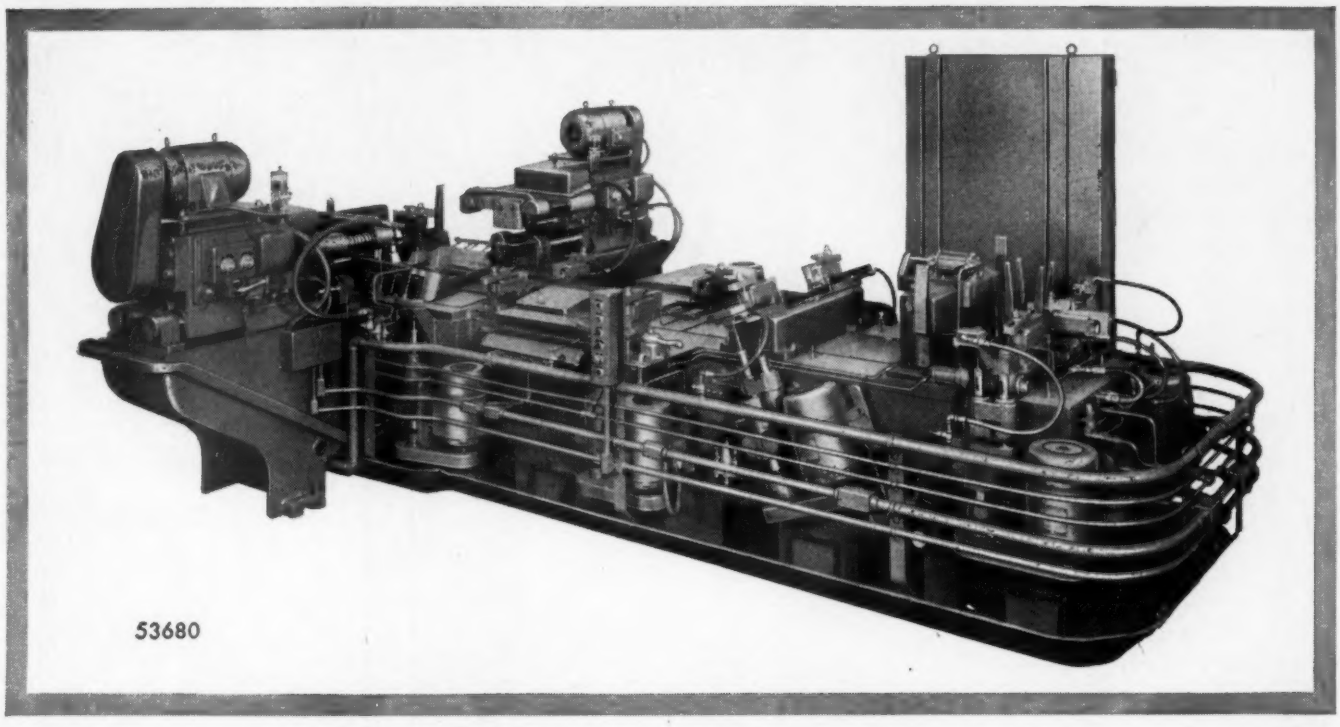
The FITCHBURG illustrated has a Heavy-Duty Bowgage Head employing two wheels on the same shaft: one 6¼" and the other 2" wide. It grinds two diameters on the illustrated washing machine shaft at the same time in a single plunge. The tolerance, in this case, ±.0001" on both diameters is no problem for the Automatic Size Control. Customers' engineers from headquarters couldn't believe their own eyes, but it still is a fact.

We may already have a Special Fitchburg designed to meet your specific needs. You'll be surprised at the number of operations that can be done at one setting, size held to tolerances previously not attempted—and all on a very high-production basis. Drop us a line today.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.



SNYDER SPECIAL DRILLING MACHINE IS ADJUSTABLE TO THREE SIZES OF AUTO FRAMES

Adjustability to three sizes of automobile frames is one of the outstanding features of this special-purpose machine designed and built by Snyder for drilling mounting holes for bodies, motors and spring suspensions.

The change-over from one size frame to another is made in very short time, the adjustment to longer or shorter sizes being made by moving the entire clamping bracket as well as the spindles, and positioning as is required by the individual frame.

Frames are located on equalizing clamps and are positioned and clamped by air cylinders and cam clamps. Side holes near the front are drilled with multiple heads driven from Snyder standard self-contained hydraulic units.

The series of vertical and angular spindles are driven from individual motors and are fed through the work by one hydraulic cylinder which actuates action pinions. This cylinder and feed mechanism is mounted on the inside of the welded steel base.

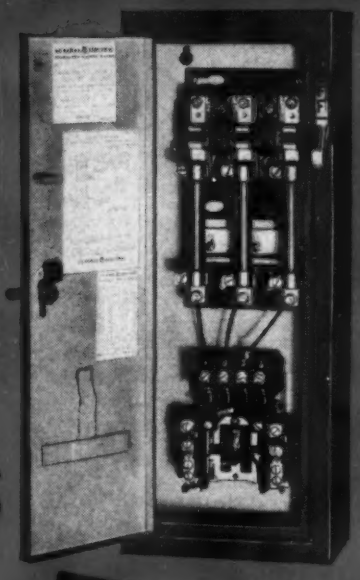
Piping for coolant, air and electric wiring is purposely kept on the outside for easy accessibility and to serve as a guard rail for operators.

The adaptability of this machine to various size parts and the saving in capital investment made possible thereby are typical of the values which Snyder engineers strive to design into Snyder special-purpose machines. Perhaps there is an opportunity in your production set-up for similar economies. *Snyder Tool and Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.*

21 Years of Successful Cooperation with Leading American Industries

SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

Sacking the seeds, one of the many processes controlled by G-E combination starters at the Rohnert plant



59 G-E COMBINATION STARTERS Control the Processing of 1/4 of the World's Vegetable Seeds

COMBINATION STARTERS SAVE TIME, SPACE, AND MONEY

Every process from eliminating dirt and debris to sorting the seed to size is controlled by G-E combination starters at the Waldo Rohnert Co., world's largest producers of garden vegetable seed.

In their four-story plant, completed in 1944, and said to be the most modern of its kind in the country, ¼ of the world's garden vegetable seed is processed—that's far more than a million pounds of clean seed a year. All electrical, it boasts 59 General Electric CR7008 combination starters and supplementary control which regulate the five separate seed mills of their complicated seed mill system.

According to Fred Rohnert, son of the founder, "*Our G-E controls and equipment have proved extremely satisfactory. They've given us no trouble since their installation.*"

And here's why these starters have proved so satisfactory—

COMBINATION STARTERS SAVE TIME—

In addition to the time saved in ordering, outstanding savings in installation time are made with these starters. Users report a 50 per-cent reduction in mounting time, a 40 per-cent reduction in wiring time, as compared with the installation of two separate devices. You connect to only 9 terminals instead of 15.

SPACE—

Valuable wall space is saved because combination starters can be installed in small, unused places either near to or remote from the operator.

AND MONEY—

While the list price is slightly higher than for two separate devices, the difference is more than made up by savings in wire, fittings, and time.

"WHAT IS YOUR APPLICATION?

Combination starters come in a variety of enclosures to meet any operating condition in your plant. If you'd like more information, ask our nearest office for Bulletin GEA-2715A. And remember, our engineers will be glad to help you with your application. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

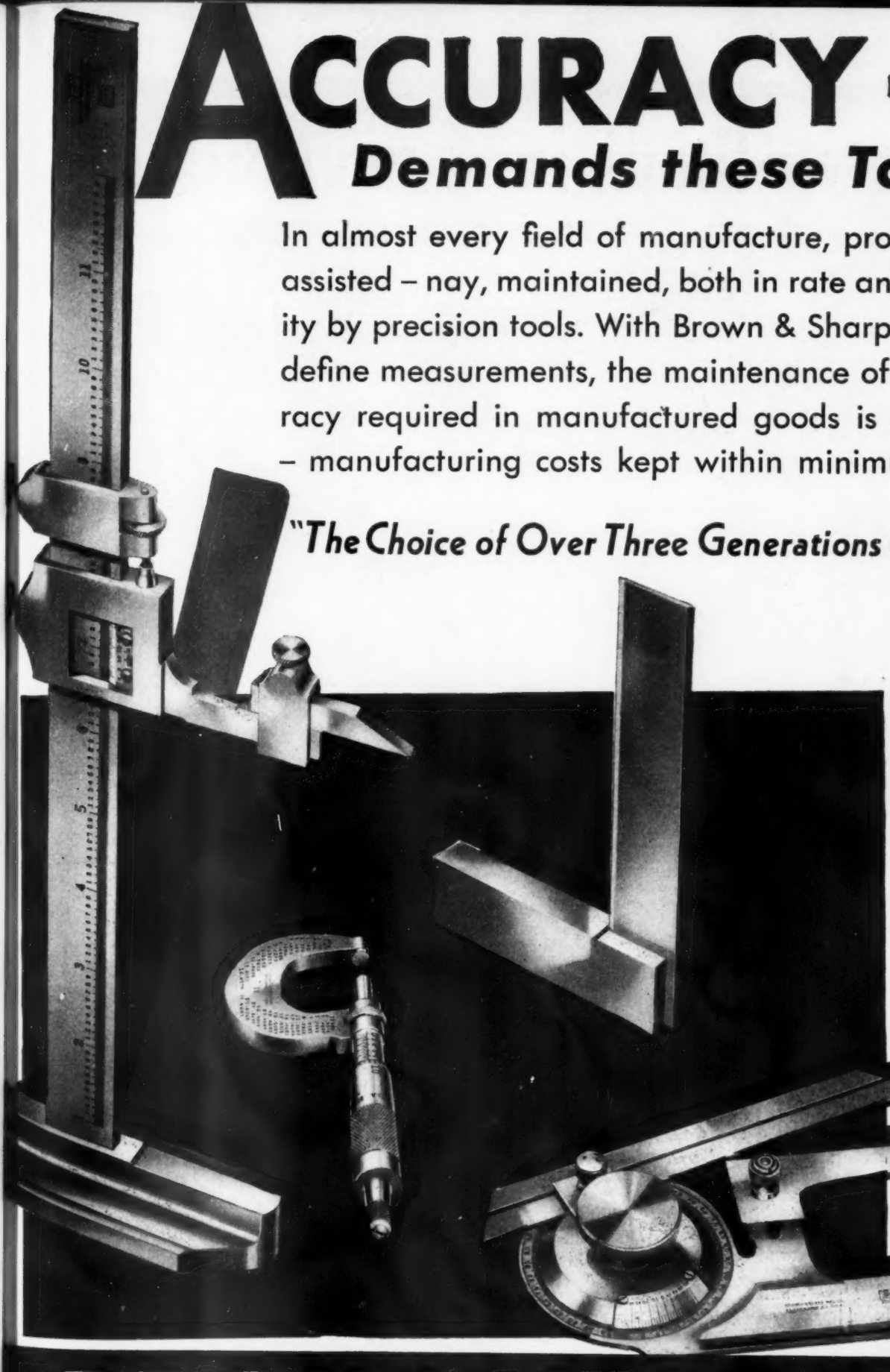
GENERAL ELECTRIC

670-201-8910

ACCURACY — *Demands these Tools—*

In almost every field of manufacture, production is assisted – nay, maintained, both in rate and in quality by precision tools. With Brown & Sharpe Tools to define measurements, the maintenance of the accuracy required in manufactured goods is simplified – manufacturing costs kept within minimum limits.

"The Choice of Over Three Generations of Machinists"



Styles and Sizes for Most Requirements

MICROMETER TOOLS
RULES
COMBINATION SETS
PROTRACTORS
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VERNIER TOOLS
GAGES
INDICATORS
TOOLMAKERS' TOOLS
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CATALOG SENT ON REQUEST
BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U.S.A.

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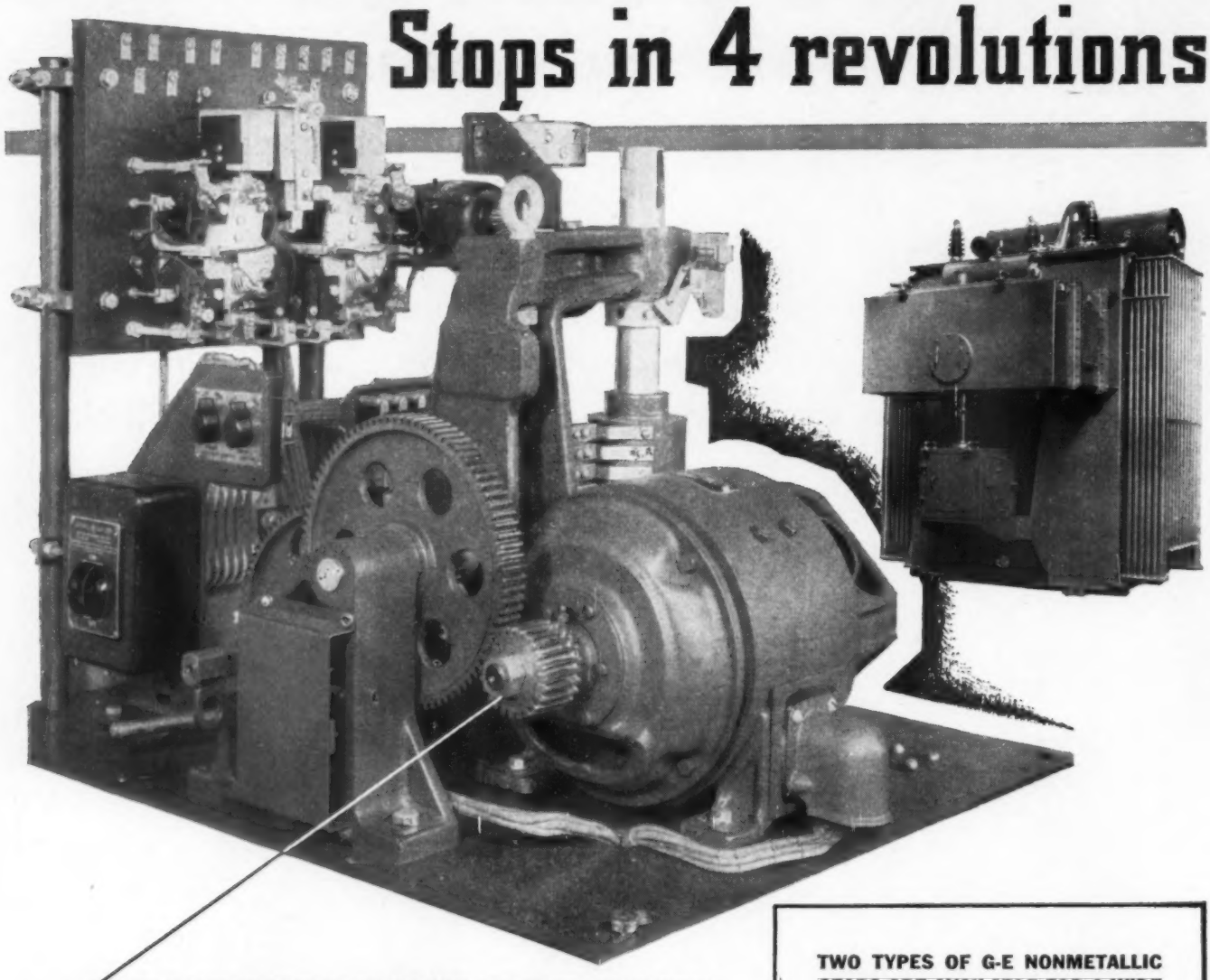
. . . We urge buying through the Distributor

BROWN & SHARPE TOOLS

Stops in 4 revolutions



HOW G-E NONMETALLIC GEARS OPERATE SILENTLY... WEAR FOR YEARS DESPITE SUDDEN STRESSES

This apparatus goes into a large General Electric power transformer. It's the driving mechanism for Load-Ratio Control equipment which enables a variety of voltages to be selected from a transformer to meet varying conditions without interrupting the load.

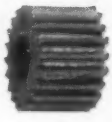
Ratio changes are made in a few seconds. In just four revolutions the motor hits a speed of 1,200 rpm. Dynamic braking stops it again in four revolutions . . . that's a test for any pinion gear. And the G-E Fabroils now being utilized have the resilience and the toughness to take these sudden start-and-stop stresses. They handle the spurts of fast power smoothly . . . give years of silent service.

G-E nonmetallic gears give the same excellent performance in many other types of equipment. They're silent—They're long wearing, and your gear cutter will gladly recommend the proper G-E nonmetallic gears for your purposes.

A bulletin, "Silent Gears", can be obtained by writing to Section Y-5, Plastics Divisions, Chemical Department, General Electric Company, One Plastics Avenue, Pittsfield, Mass.

TWO TYPES OF G-E NONMETALLIC GEARS ARE AVAILABLE FOR A WIDE VARIETY OF APPLICATIONS

G-E FABROIL
for heavy-duty applications consist of compressed cotton fibers held together by steel shrouds and threaded studs.



G-E TEXTOLITE
for lighter jobs consist of numerous layers of woven fabric held in compression by a phenolic-plastics resin.

BOTH ARE
SILENT–STRONG–RESILIENT

EVERYTHING IN *Plastics*

GENERAL ELECTRIC

GENERAL ELECTRIC PLASTICS FACTORIES ARE LOCATED IN FT. WAYNE, IND. • MERIDEN, CONN. • SCRANTON, PA. • TAUNTON, LYNN AND PITTSFIELD, MASS.

WHEN A DIFFERENCE IN

Speed

MAKES A DIFFERENCE IN

Profit

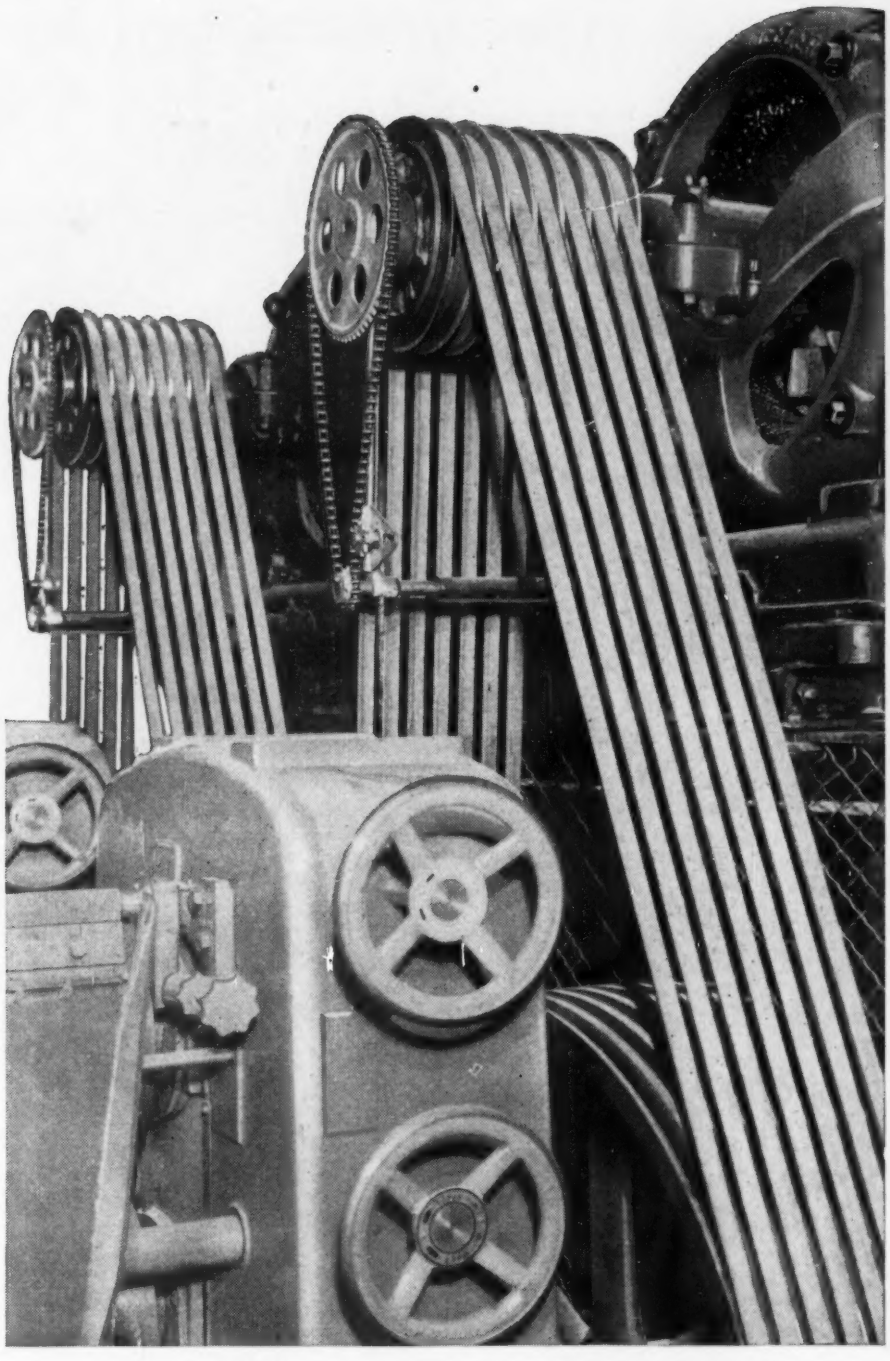
—When you can get greater efficiency, economy or output from a machine through flexible, accurate control of its operating speed — use a TEXROPE VARIABLE SPEED DRIVE! No special motor or costly reduction gears to install. In many cases, the only change required is to replace the regular drive sheave with a TEXROPE Vari-Pitch Sheave.

TEXROPE Variable Speed Drives

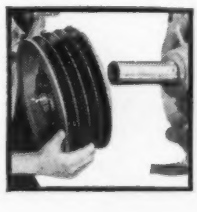
Here's a wide range of equipment to meet every need: TEXROPE Vari-Pitch sheaves for stationary or motion control — TEXROPE Wide-Range Vari-Pitch Sheaves and V-Belts — Speed Changer units. Speed variations up to 375% are possible. Ask your nearest Allis-Chalmers office or dealer for bulletin No. B6082-A.

V-Belt Drive Headquarters

Your A-C dealer has a full line of V-Belt Drive equipment—TEXROPE Super-7 V-Belts, sheaves and Variable Speed Drives. Get all your needs from one reliable source . . . from the originators of industry's Multiple V-Belt Drive. ALLIS-CHALMERS, MILWAUKEE 1, WIS.



(ABOVE) TEXROPE Vari-Pitch sheaves for motion control. They give smooth speed variations up to 25% on these roller mills used in the manufacture of soap chips. Changes in speed are made without stopping the machines.



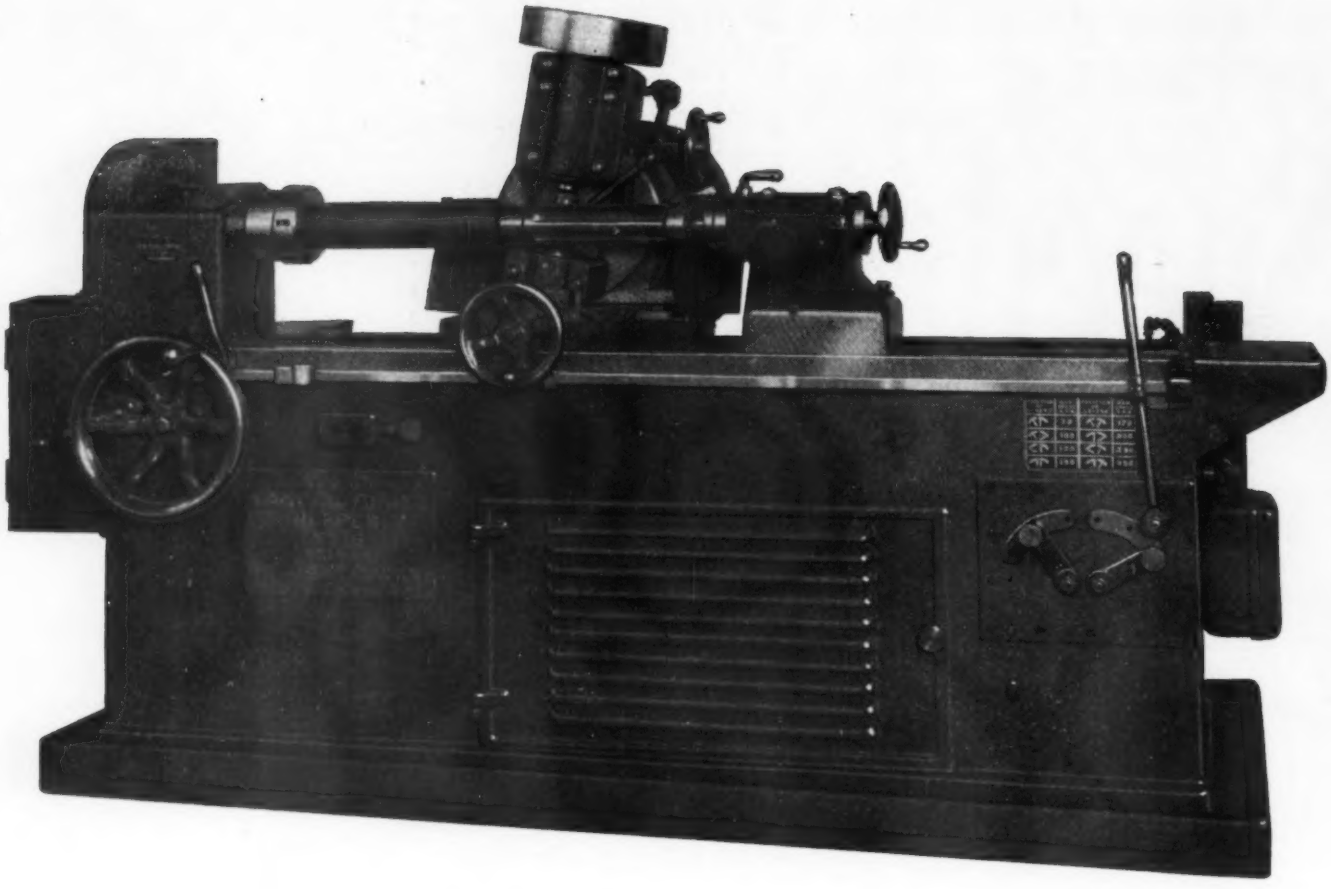
"MAGIC-GRIP" Sheave for fast changes

Here is the standard heavy-duty sheave for fast, easy mounting and demounting. *Sheave comes completely assembled.* Simply slip it on the shaft, move it to exact alignment, and tighten three cap screws. It's locked on the shaft with the grip of a vise — yet can be removed just as easily. No hammering, filing or reaming. No set screws to damage shaft. A2103

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

TEXROPE V-BELT DRIVES



ECONOMICAL PRODUCTION

ADAMS

Manufacturing Hobber

- **GREAT RIGIDITY**
- **EXTREME PRECISION**
- **UNUSUALLY SIMPLE SETUPS**
- **ADAPTABLE FOR LONG OR SHORT RUNS**

You can depend on this ADAMS Manufacturing Hobber to maintain exceptionally high standards in spur gear and splined shaft hobbing.

This Hobber has great rigidity and it gives you precision results. Made in two sizes. Write for booklet which gives complete details.

ADAMS

THE ADAMS COMPANY
DUBUQUE, IOWA

ESTABLISHED 1883

Double Action

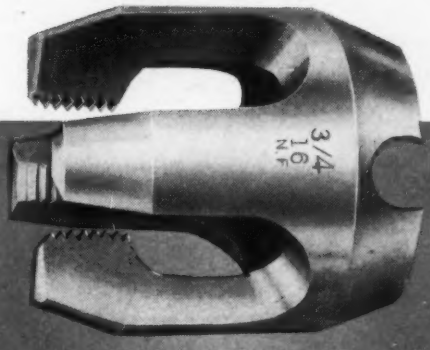
P&W Duocone Dies Assure Perfect Alignment and Provide a Positive Drive

Light . . . Strong . . . Compact . . . P&W Duocone Dies are designed and manufactured for use in automatic screw machines but will function equally as efficiently in semi-automatics, turret lathes and drill presses.

Duocone Dies will lower operating costs by giving maximum service in thread-cutting operations. When used with their proper Die Holders, Duocone Dies assure the operator of proper die alignment and provide a positive drive—"double action"—which increases production on your machines. Reversing Holders for Duocone Dies are available for automatics and releasing holders for semi-automatics, turret lathes and drill presses.

P&W Duocone Dies are the result of many years of laboratory and practical experiment. Correctly designed, scientifically heat-treated, and precision made, Duocone Dies are manufactured in accordance with the P&W principle—"produced under conditions of use". They comply with Pratt & Whitney standards of accuracy.

Write for circular.



A Word About Duocone Dies From One of Our Customers

"As you are aware we have used your Duocone Dies over the period of the past four years. These dies have been used in our Automatic Screw Machine Department to cut threads both standard as well as special and in a variety of materials ranging from stainless steel to bronze. In many instances when other means of producing satisfactory threads have failed, Duocone Dies have been the answer to some of our most difficult threading problems.

"We have found your Duocone Dies together with the holders as furnished for these dies by your company to be an exceptionally satisfactory method of producing good accurate threads on high speed screw machines as well as screw threading machines".

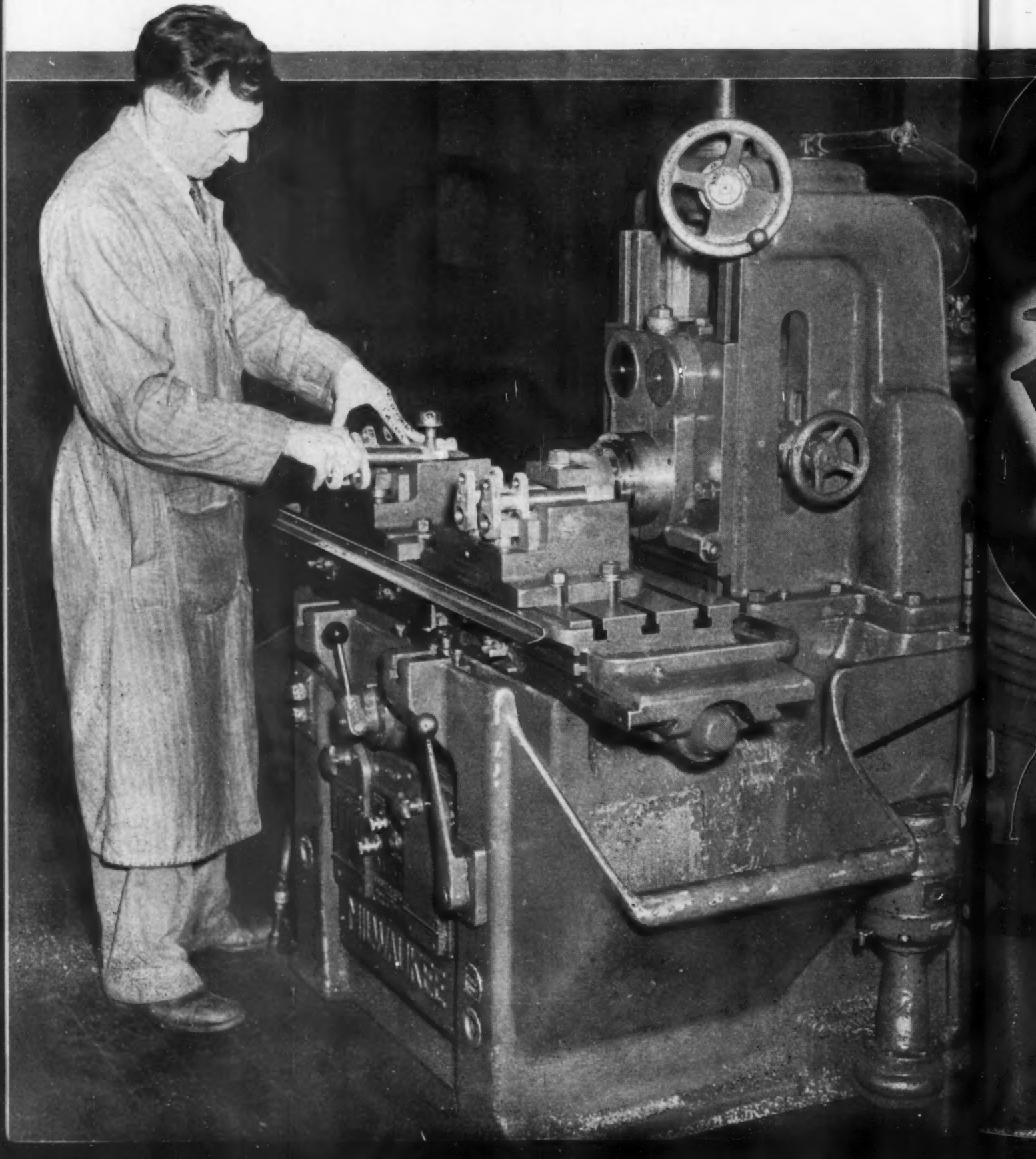
PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT

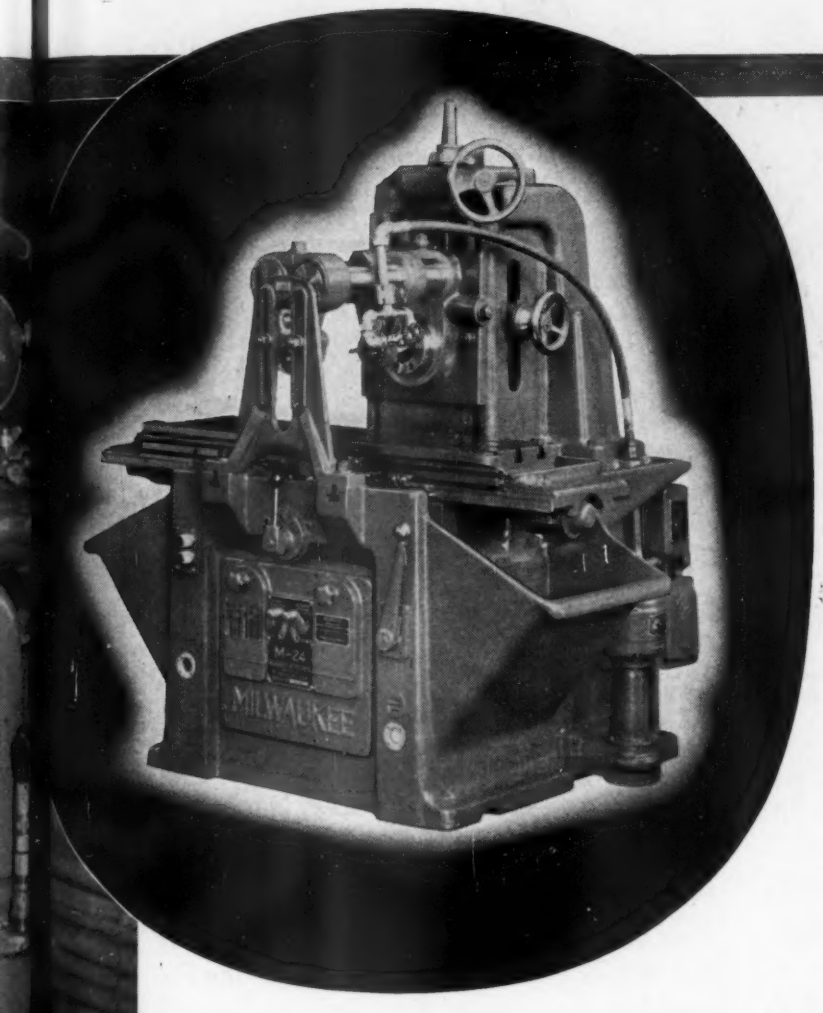
YOU CAN GET MINIMUM

with *CONTINUOUS* Automatic Two-way Cutting Cycle on the KEARNEY & TRECKER M-24 Simplex Milling Machine



IDLE TIME...

The Kearney & Trecker M-24 Simplex milling machine permits continuous operation with minimum idle cutter time. Cast steel rods shown here being milled to length. Operation is speeded up by use of twin work holding fixtures, each accommodating two workpieces. A carbide steel milling cutter is applied on a continuous, automatic two-way cutting cycle. Automatic hydraulic controls for the table movement make the M-24 Simplex ideally suited to this job.



The compact construction of M Series machines reduces the necessary floor space to a minimum. Convenient table height facilitates setup and loading operations. The machines are available with either 18", 24" or 30" of power feed to table.

Kearney & Trecker M Series machines perform a wide variety of milling operations on small or medium-sized parts. Being equipped with a completely automatic and manual control system, they are readily adaptable to long or short run jobs.

CHECK THESE FEATURES

Three bearing spindle, double overarms, arbor supports and outer arm brace assure maximum rigidity and accuracy.

Climb cutting equipment is standard—includes an adjustable nut and a fixed nut on a ground table feed screw to eliminate backlash in both directions.

Pick-off speed and feed gears available for two speed ranges and three feed ranges to meet individual requirements.

Simplified directional controls assure ease of operation.

Built-in coolant and chip disposal sytem.

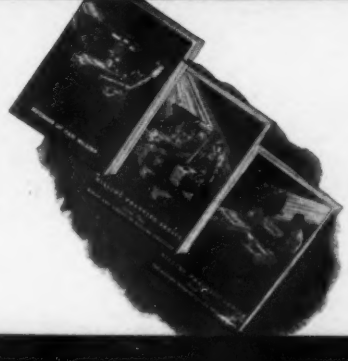
Write for complete data on M-24 Machines — BULLETIN No. B10A. *Please indicate your business connection.*

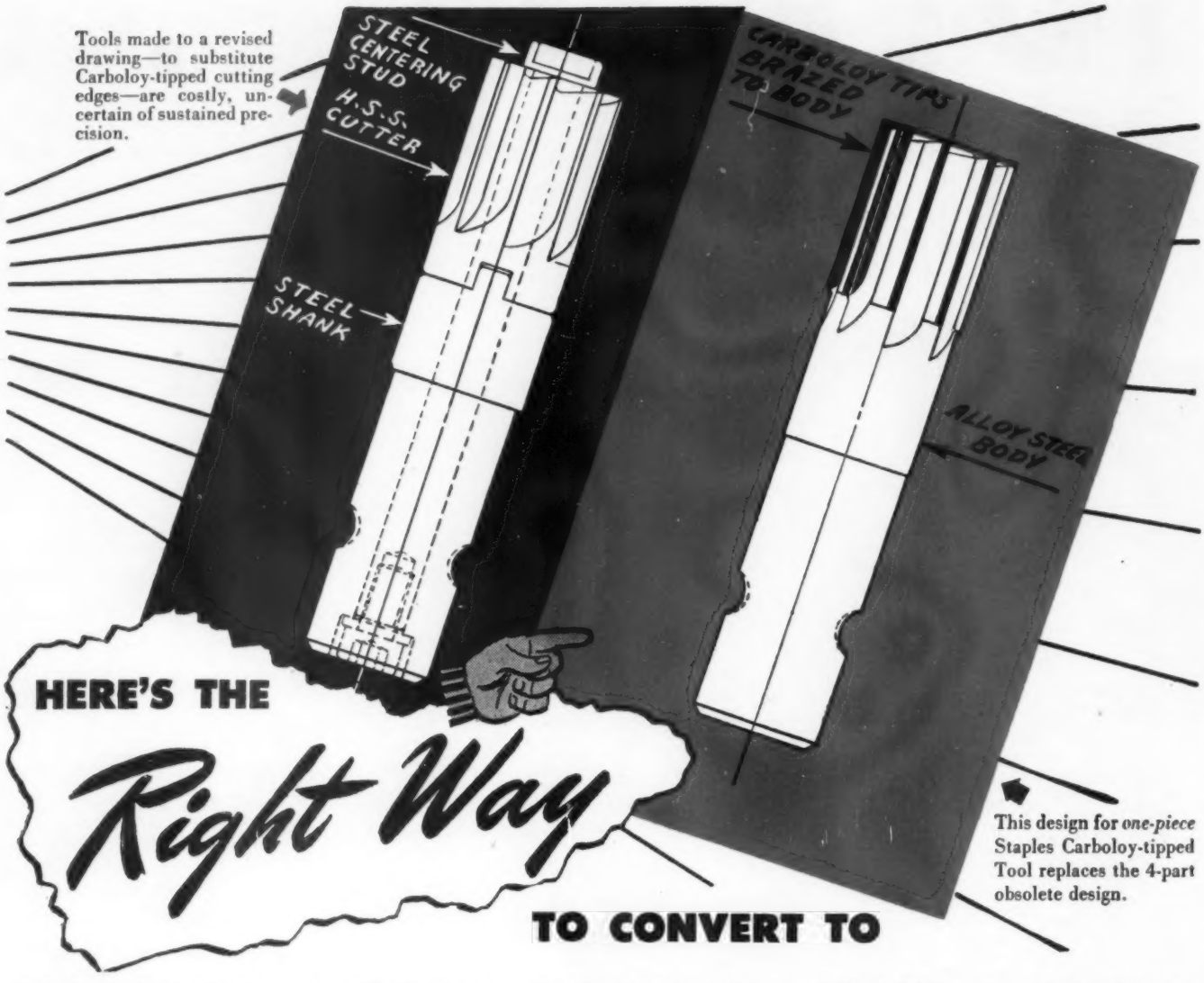
KEARNEY & TRECKER CORPORATION

MILWAUKEE 14, WISCONSIN *Milwaukee Machine Tools*

FREE EDUCATIONAL BOOKS

Easy-to-understand, well illustrated, the Milling Practice Series of Booklets are useful reference manuals on milling machine care, operation, and applications. The following are available on request; write on your business letterhead: Book One — Right and Wrong in Milling Practice; Book Two — The Milling Machine and Its Attachments; Methods of Cam Milling.




Tools made to a revised drawing—to substitute Carboloy-tipped cutting edges—are costly, uncertain of sustained precision.
STEEL CENTERING STUD
H.S.S. CUTTER
STEEL SHANK
CARBOLOY TIPS BRAZED TO BODY
ALLOY STEEL BODY
This design for one-piece Staples Carboloy-tipped Tool replaces the 4-part obsolete design.

HERE'S THE

Right Way

TO CONVERT TO

CEMENTED CARBIDE CIRCULAR CUTTING TOOLS

YOU GO FAR TOWARD OFFSETTING TODAY'S HIGHER WAGES through the increased production you get with STAPLES Carboloy cemented carbide tipped circular cutting tools. Their extra-hard edges cut deeper, cleaner to closer tolerances, faster. They require fewer resharpenings.

When you convert from high speed steel—as many another manufacturer is doing these days—convert *all the way*. High speed steel tools with Carboloy tips applied to the shanks are less efficient, and cost more than specially designed or standard high precision StaplesTools.

Send us drawing of your high speed steel tool, and Staples engineers will submit drawing for complete new Staples Carboloy-tipped Tool, designed to take full advantage of cemented carbide superiorities.

Meet the challenge of increased wages with Staples Carboloy-tipped Tools. Mechanical science offers nothing finer.

THE STAPLES TOOL COMPANY

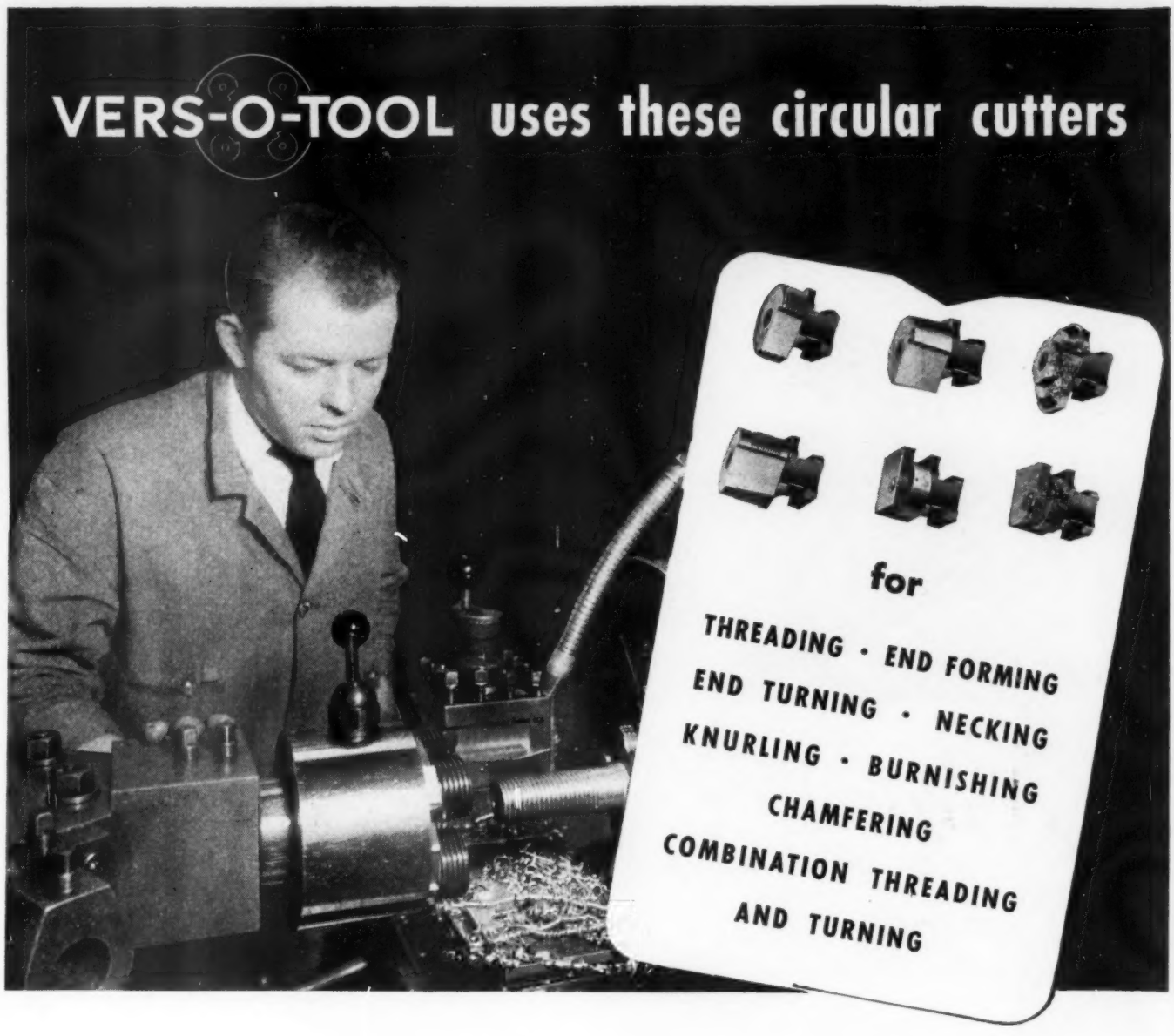
Formerly Staples Tool & Engineering Company

CINCINNATI 25 **OHIO**

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

VERS-O-TOOL uses these circular cutters



Here is a modern tool that is just as flexible and adaptable as a brace and bit.

In this hardened and ground, simply-constructed head, you can insert a variety of circular chasers for threading, or change quickly to circular cutters for end forming, end turning, chamfering, knurling, burnishing or combination threading and forming.

You can replace chasers or cutters in a minute, after regrind and without disturbing the setup. Circular cutters and chasers last 20 to 50 times longer—they can be reground through 270° circumference.

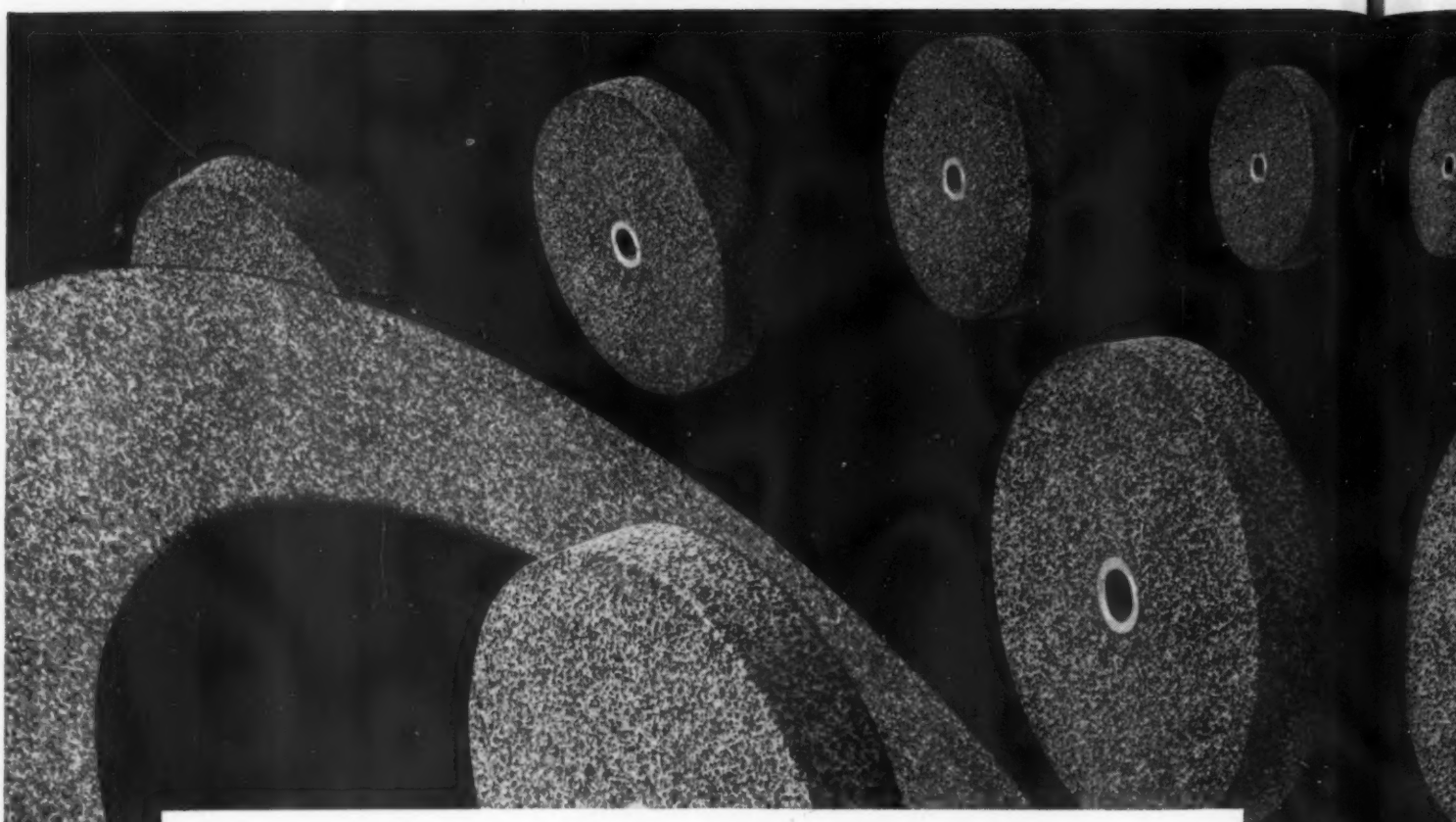
If you're not already using Vers-O-Tools you may be overlooking many opportunities to reduce costs two ways—in tool investment and in more production per hour.

Catalog D-42-C will give you all details

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing



Ever suspect you're grinding away profits?

Grinding is a simple looking operation at first glance. But as you take a careful second glance, you're likely to spot low production rates, excessive wheel replacements—in short, profit leaks.

Men who figured they are too close to their grinding to get a candid viewpoint, and who have asked Peninsular engineers to take that "second glance" for them, have often been pleasantly surprised at the savings they've made.

No reason why you can't find out if similar savings could be made in your plant. Peninsular engineers are available for a careful study of your grinding operations. This study includes a thorough analysis of your equipment, of the material to be ground, and of all other important factors that influence costs.

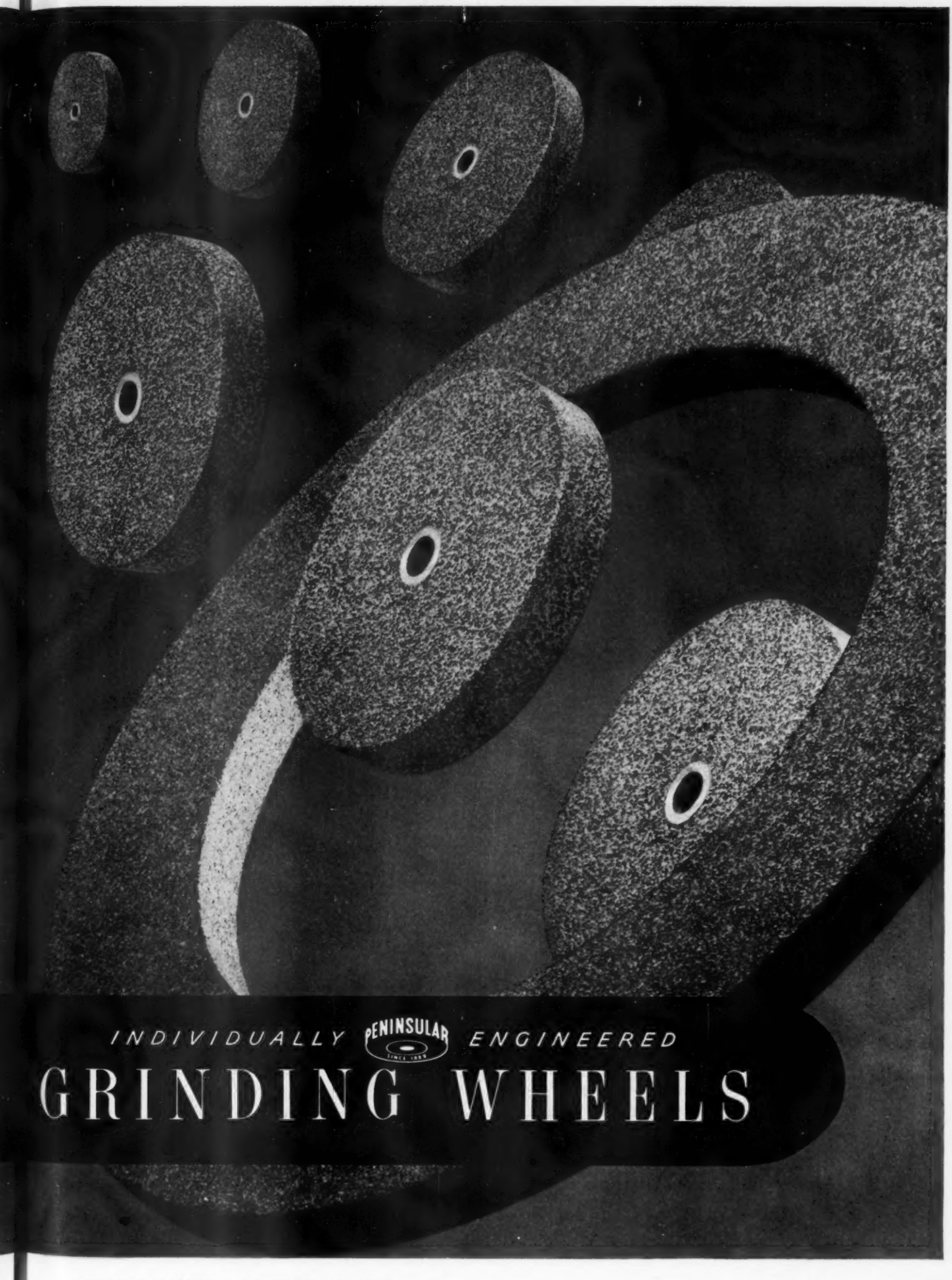
Their findings are used to develop a special formula and the proper shape for grinding wheels that are completely efficient for your work. *Every* Peninsular grinding wheel is specially made for its particular job.

The Peninsular Grinding Wheel Company, 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Boston, Buffalo, Cleveland, Newark, Pittsburgh, Houston, St. Louis, Cincinnati.

PENINSULAR G

SINCE 1889

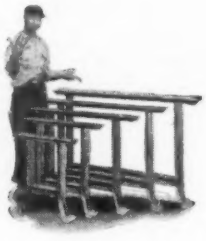
SPECIALISTS IN RESINOID BONDED WHEELS


INDIVIDUALLY PENINSULAR ENGINEERED
GRINDING WHEELS

A-B-C's OF HALLOWELL WORK BENCHES OF STEEL

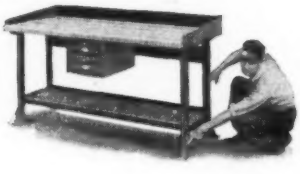
A — AVAILABLE IN 5 DIFFERENT HEIGHTS, 7 STANDARD LENGTHS

With "Hallowell" workbenches of steel, you can choose from about 1300 ***ready-made*** combinations. 5 heights and 7 lengths, interchangeable shelf, drawer and cabinet units give you the chance to pick out just the style bench that will fit your individual requirements.



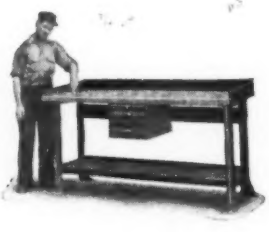
B— ABSOLUTE STEADINESS

Flanged and ribbed steel leg construction insures that "Hallowell" Workbenches will stand firm and rigid without costly bolting to the floor. This also permits great flexibility in shop arrangements, as the benches can easily be moved about.



C— GREAT STRENGTH

Finest construction is your guarantee of extra-long wear, regardless of abuse. Tops stay smooth and serviceable . . . give you "lifetimes of wear."



Write today for the "Hallowell" Catalog of Shop Furniture. "Unbrako" and "Hallowell" products are sold entirely through distributors.

ARMY E NAVY

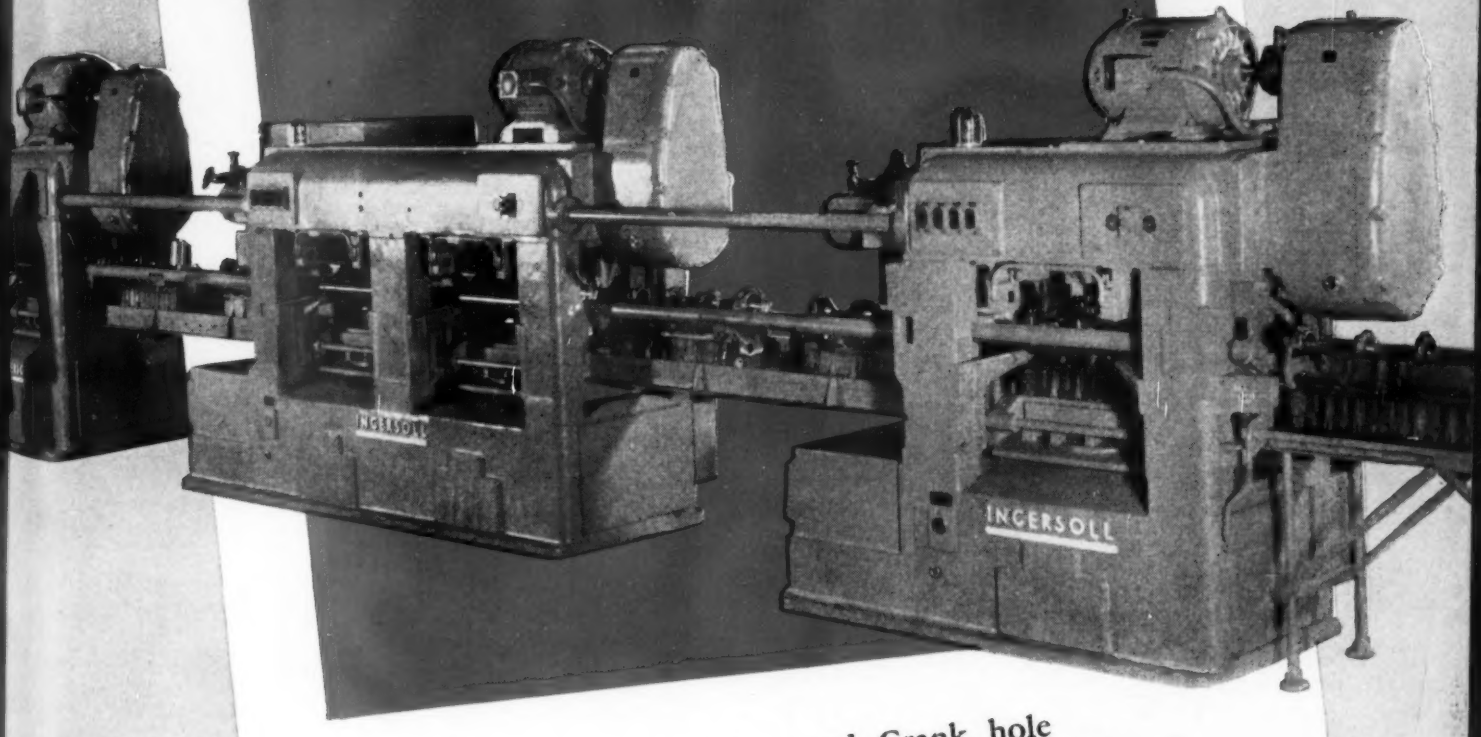
OVER 43 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

PRECISION BORING

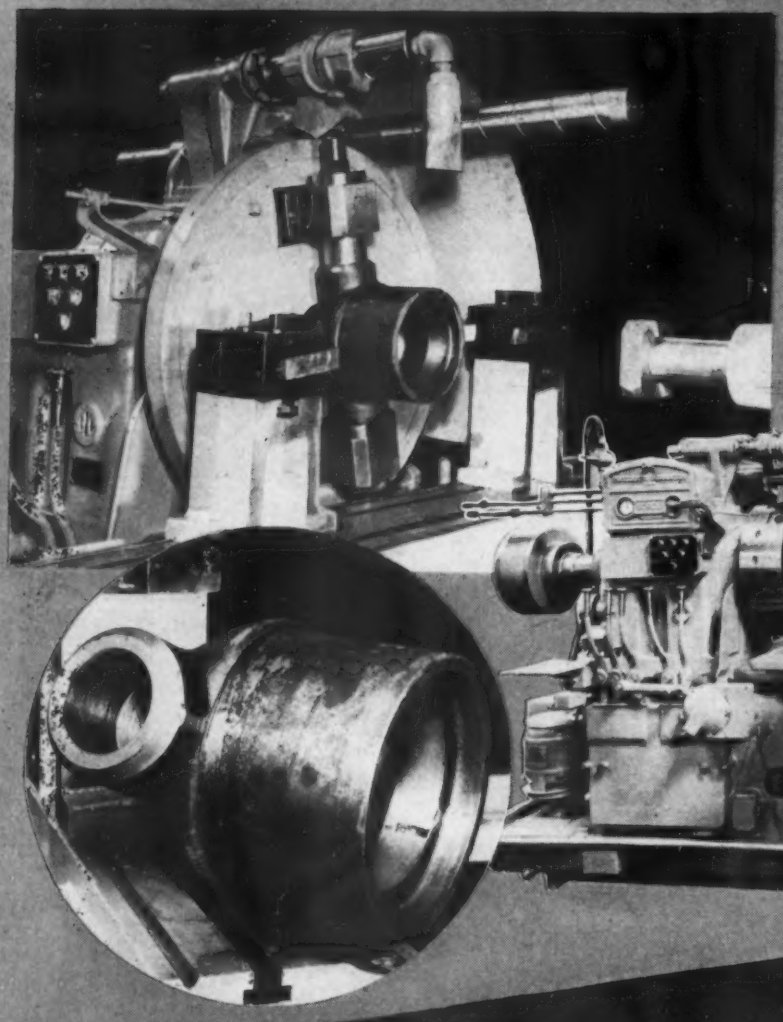
Accurate and Fast



This Ingersoll 4-Station Cam and Crank hole boring machine bores at rate of 107 automobile cylinder blocks per hour . . . In each block there are four crank shaft bearing holes and four cam shaft holes. Each hole is rough bored, semi-finish bored, and finish bored within a limit of .0005″ plus or minus. The alignment of the bores must be within a limit of .00075″ . . . This machine including fixture and tooling was developed, designed, and built by Ingersoll.

INGERSOLL

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS



Illustrating what is meant by
"TOOLING FLEXIBILITY" *on the*

P&J 6DREL AUTOMATIC

DETAILS OF OPERATIONS

Part: Terminal

Material: Steel Forging

Hardness: 276 Brinnel

Method: Presenting cross hole end to spindle; grip on OD of flange with 2 Jaws: position against stop pin at cross hole hub.

Machine as follows:

1st. T.F. . . . Rough bore 5.567" dia. to bottom: square up bottom: bore 6¾" dia. approx. ⅞" deep: rough turn and face thread dia.: rough face shoulder.

2nd. T.F. . . . Remove surplus stock from bore rear of pinion bosses: single point with Slide Tool: bore 6¾" dia. x ⅞" deep.

3rd. T.F. . . . Semi finish thread dia.: face end and shoulder: bore 5.567" 6¾" dia.

4th. T.F. . . . Bore undercut 6⅝" dia.: (Slide Tool)

5th. T.F. . . . Finish bore 5.567" dia. (for locating purpose only).

6th. T.F. . . . Form 6⅝"-6¾" dia.: form radii (Slide Tool).

Subjects rough machined and heat treated (400 Brinnel) before coming to this operation: Presenting cross hole end to spindle, place subject in fixture, locating on plug in reamed cross hole dia.; Position with bar in turret and hold in place with clamp nut and washer on top side.

Machine as follows:

1st. T.F. . . . Positioning bar

2nd. T.F. . . . Semi finish turn and face shoulder and thread dia.: bore 6¾" dia. approx. ⅞" deep: bore 5.567" dia.

3rd. T.F. . . . Blank.

4th. T.F. . . . Finish surfaces as machined on 2nd. T.F.

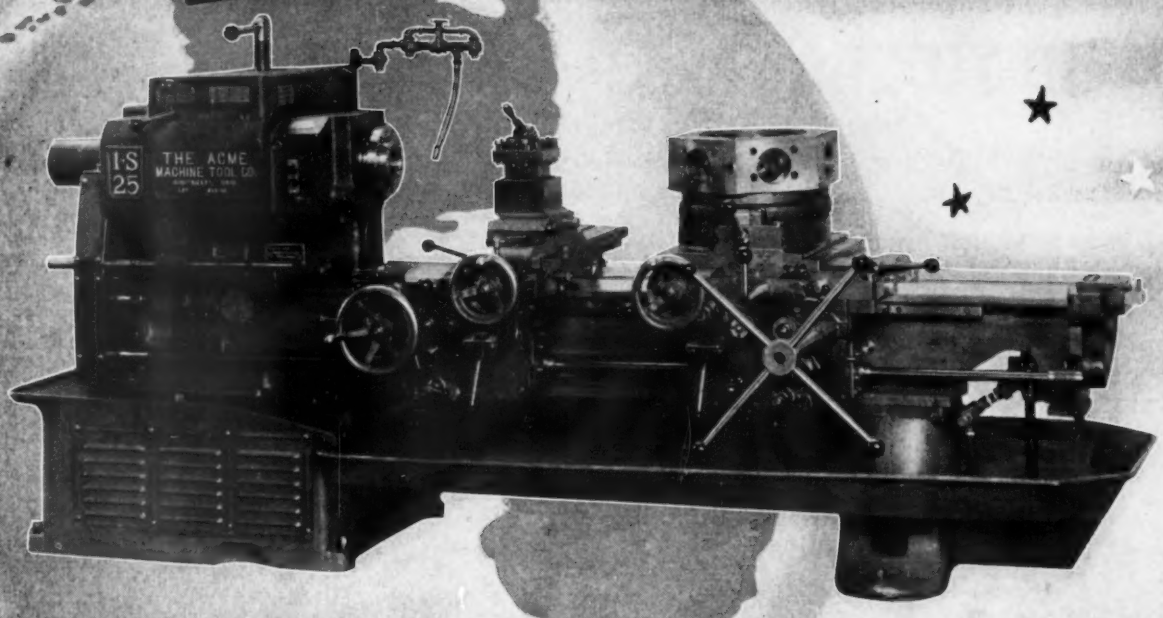
5th. T.F. . . . Blank.

6th. T.F. . . . Size bore 5.567" dia.

Ask P&J engineers for assistance in applying their specialized experience in tooling to your problem.

POTTER & JOHNSTON MACHINE CO., PAWTUCKET, R. I.

FAMOUS THE WORLD OVER
THE ACME TURRET LATHE



The Acme Turret Lathe is the machine with a future. In the production of today and tomorrow Acme takes a high place. Power—Speed—Rigidity—Accuracy—Durability—5 keynotes of the Acme Turret Lathe that insures top production for years to come.

★ **BUILT TO LAST**

★ **DESIGNED FOR THE FUTURE**

WRITE US FOR
COMPLETE INFORMATION

THE ACME MACHINE TOOL CO.
CINCINNATI 32, OHIO

Gentlemen: Please send me without obligation Engineering data, bulletin, etc.

NAME_____

COMPANY_____

ADDRESS_____

The ACME MACHINE TOOL Co.
CINCINNATI 32, OHIO

RED RING MACHINES

SHAVE GEARS UP TO 220" P. D.

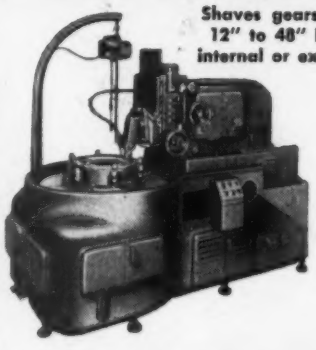
If it's a spur or helical gear of any size up to 220" P. D. there is a Red Ring Machine on which it can be shaved.

Gears up to 36" P. D. may also be shaved to the Elliptoid tooth form on Red Ring Rotary Shaving Machines.

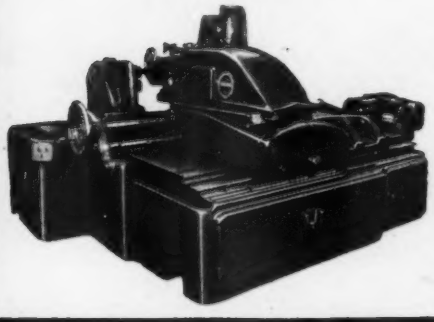
Shaves gears from 1" to 24" P. D.

Shaves gears from 3/16" to 4" P. D.

Shaves gears from 12" to 48" P. D., internal or external.



Shaves gears from 4" to 48" P. D.



Shaves gears from 24" to 120" P. D.

Shaves internal gears from 3" to 12" P. D.

NATIONAL BROACH AND MACHINE CO.

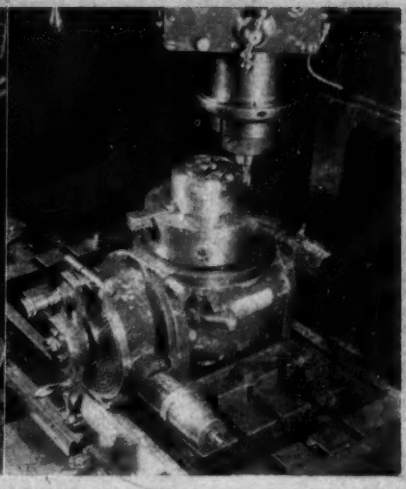
5600 ST. JEAN — RED RING ◯ PRODUCTS — DETROIT 13, MICH.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

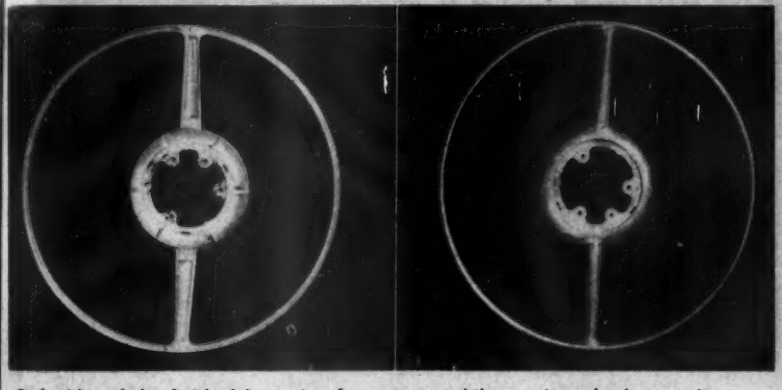
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

Shortcut to Production

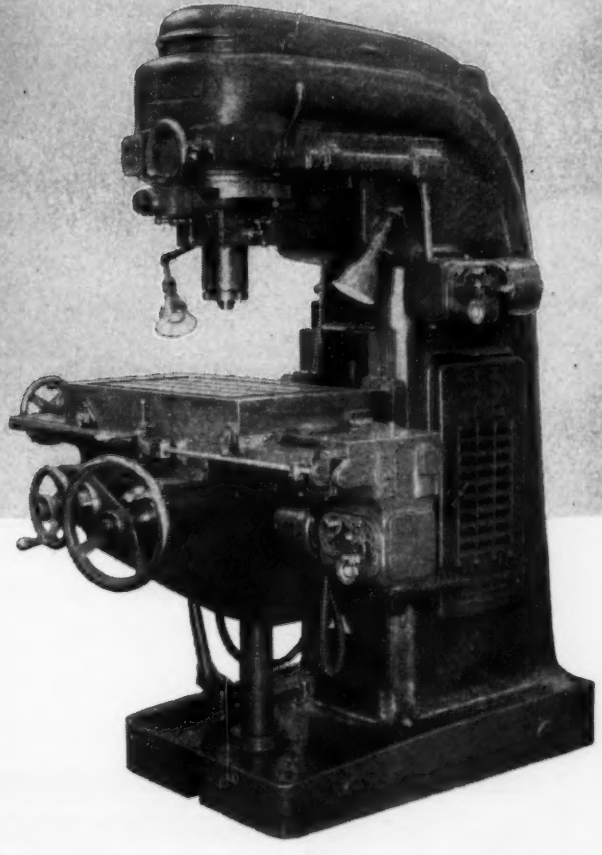
KEARNEY & TRECKER ROTARY HEAD MILLER COMPLETES COMPLEX 3 PART DIE DIRECT FROM BLUEPRINT TO WORK-PIECE. NO TEMPLETS OR MODELS REQUIRED



1. Shows set-up of completed ejector half of die. Note rotary table using power take-off from machine for circular milling. All operations on die face completed in single set-up. Total set-up and machining time for this piece — 69.4 hours.
2. Set-up for cover half of die. All operations on die face completed in single set-up. Total set-up and machining time for this part—74.2 hours.
3. Set-up for machining center insert part of die. Note deep narrow slots — end milled. Universal Spiral Dividing Head provides for positioning of work piece. All operations on die face completed in single set-up. Total time for set-up and machining — 86.2 hours.



Both sides of the finished horn ring for an automobile steering wheel — as it comes complete from the die being machined above.



DIRECT — ACCURATE — FAST — are the three factors that make the Kearney & Trecker Rotary Head Milling Machine so outstanding for toolroom, experimental, and manufacturing work. DIRECT — because it mills intricate shapes in a single set-up, transmitting blueprint dimensions direct to the workpiece without the aid of models or templets. ACCURATE — because there is exact control of all mechanical movements. FAST — because initial preparation and multiple set-ups are eliminated.

For complete information write for Catalog 1002C.
Please give your business connection.

Kearney & Trecker
CORPORATION
MILWAUKEE 14, WISCONSIN

We certainly don't expect you to join our growing list of customers *unless* we can give you better abrasive products for *your particular production jobs* . . . plus better service.

Our rapid growth in ten years from one of the smallest makers of abrasive products to one of the largest, didn't just happen. Company after company found we could help them get better production, lower costs . . . and give them better service. That's how we built our business.

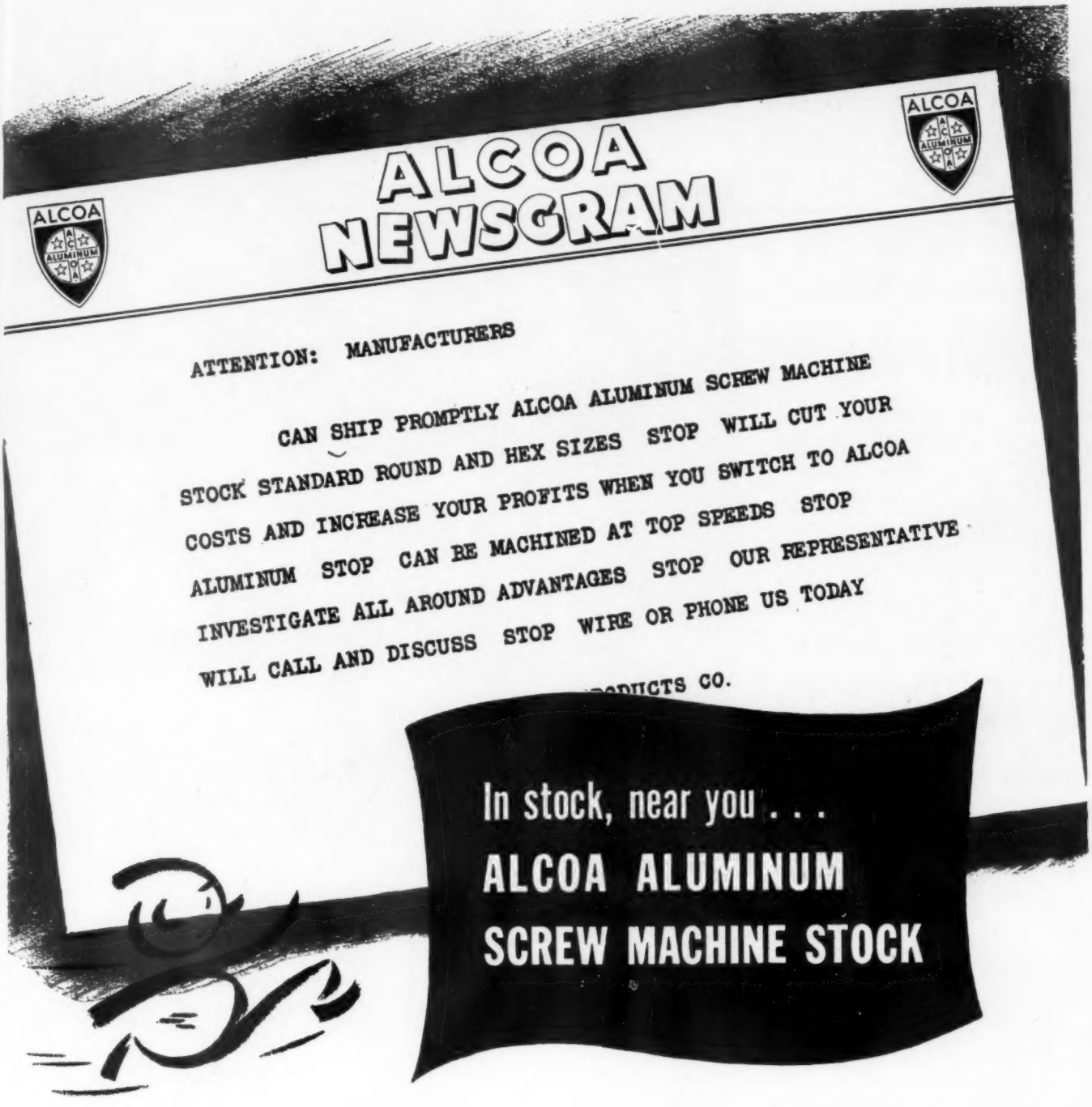
Should you use MID-WEST abrasives? The only way we know for finding out is for you to give us a trial. It's worth it . . . if you're looking for better production, lower costs, and better service. Call us. We'll cooperate.

James Jackson
PRESIDENT

MID-WEST ABRASIVE COMPANY

OWOSSO, MICH. DETROIT ROCHESTER, PA.

GRINDING WHEELS HONING STONES COATED ABRASIVES


ALCOA
NEWSGRAM
ATTENTION: MANUFACTURERS
CAN SHIP PROMPTLY ALCOA ALUMINUM SCREW MACHINE
STOCK STANDARD ROUND AND HEX SIZES STOP WILL CUT YOUR
COSTS AND INCREASE YOUR PROFITS WHEN YOU SWITCH TO ALCOA
ALUMINUM STOP CAN BE MACHINED AT TOP SPEEDS STOP
INVESTIGATE ALL AROUND ADVANTAGES STOP OUR REPRESENTATIVE
WILL CALL AND DISCUSS STOP WIRE OR PHONE US TODAY
In stock, near you . . .
ALCOA ALUMINUM
SCREW MACHINE STOCK

It's available for prompt shipment to you, from warehouse stocks all over the country . . . This is the message sent out recently by Alcoa's Distributors. No need to hold up your production, waiting for hard-to-get materials.

Remember, with aluminum you get three times as many pieces per pound. Allow for that weight differential when figuring on screw machine products. For the names of distributors of Alcoa Aluminum Screw Machine Stock, call the nearby Alcoa office. Or write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

IN EVERY COMMERCIAL FORM

"More Profitable than

QUIET...

IT WOULDN'T WAKE A BABY

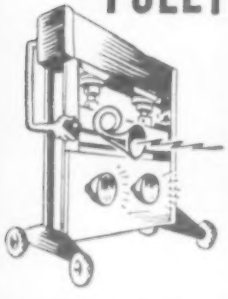
Easy, even hydraulic pressure does the work. No jarring impact as the die bottoms. No shock to the worker to lessen efficiency.

VIBRATIONLESS

GLASS OF WATER ON THE PLATEN, YOU'LL NEVER SPILL A DROP

That's how evenly pressures are distributed over the unit. That too, is another reason why dies last longer in a KRW.

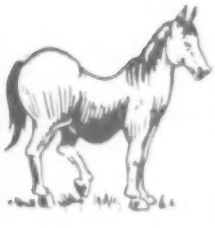
FULLY EQUIPPED



EVEN TO HEADLIGHTS AND HORN IF YOU WANT 'EM

Connect to your 220 line, install your dies, and you're ready to go for bigger profits. Each unit is equipped with adequate power plant to meet your needs.

DEFLECTION NIL



NO SWAYBACK PLATENS TO WORRY ABOUT

Where pressures require it, bed rails, platens and head are trussed and ribbed to eliminate any deflection. Press illustrated stamps three jambs per stroke.

MOBILE...

PUT IT ON CASTERS IF YOU WANT TO

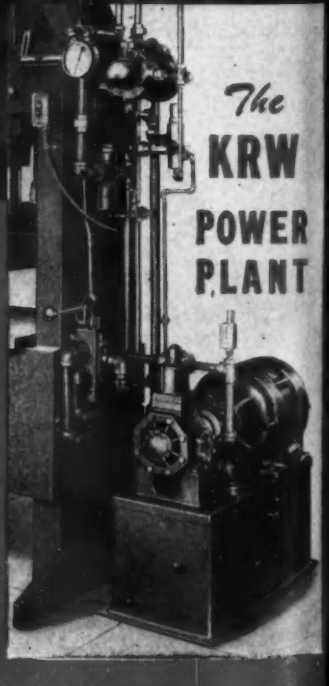
It weighs only 5,500 lbs., and because it is hydraulically operated, with pressures evenly distributed, no foundation bed is necessary. The secret to this is KRW's welded design.

Specifications

KRW 100-TON PRESS BRAKE

Upper Platen	2½" x 14" x 44"
Lower Platen	2" x 12" x 44"
40 Strokes per minute	
Floor Space Req. Incl. Power Plant	42" x 80"
Overall Height	94"
Weight Incl. Power Plant	5,500 lbs.
Ram Pressure 100 tons	
Automatically Controlled Stop	

Can be made as gap type, or with open or closed ends. Distance between uprights and length of platens can be increased or decreased, depending on your needs.



Politics or Stamping Silver Dollars!"

...K. R. Wilson

THIS 100-TON KRW HYDRAULIC PRESS BRAKE PRODUCES JAMB SECTIONS FOR 2000 WINDOWS A DAY AT A FRACTION OF THE COST OF HEAVIER EQUIPMENT ... HOLDS WORKER FATIGUE TO A MINIMUM!

This press had been in operation only a few days before the Wendling Iron Works of Buffalo ordered three more—that's how satisfactory it proved in use. Now it is turning out 4,000 jamb sections for 2,000 windows, illustrated below, in two 8-hour shifts a day. No longer is it necessary to buy tons of unnecessary weight in a press in order to get efficient production. KRW welded construction plus scientific distribution of stress and load has radically changed all that. This 100-ton KRW press weighs a fraction, and costs a fraction of comparable equipment.

Because this press is hydraulically operated and not mechanically driven, it is quiet and almost vibrationless in operation. The press cannot be jammed by careless operation—the platen can be stopped and reversed at any point in its travel. Two heavy-duty cylinders develop controlled pressure to perform the work. Pressure is perfectly equalized between these cylinders by the exclusive KRW mechanical linkage and torque bar arrangement. Pump equipment varies depending upon customer requirements. This press can be engineered as a gap type or with open or closed ends. Platens will take standard dies. Adaptable for all light metal press work. Write for details, or better still, tell us what you want to accomplish and we'll quote you specifically. Mail the coupon.

DIES QUICK DELIVERY TO YOUR SPECIFICATIONS

We have arranged dependable connections for the manufacture of all types of dies for KRW Press Brakes. Send us your blueprints and specifications for accurate costs and delivery date.

4,000 jamb sections, 2,000 windows a day. That's production. Jamb is formed in two operations, first operation shown at right.

Formed from 14 Ga. hot rolled steel.

NAME YOUR NEEDS
WE'LL QUOTE PRICE AND QUICK-DELIVERY DATE..FILL OUT AND MAIL COUPON

K. R. WILSON, 215 Main St., Buffalo 3, N. Y.

Please give me the facts regarding the KRW 100-ton Press Brake.

Name .....

Address .....

City ..... Zone ..... *State* .....

Capacity and size needed .....

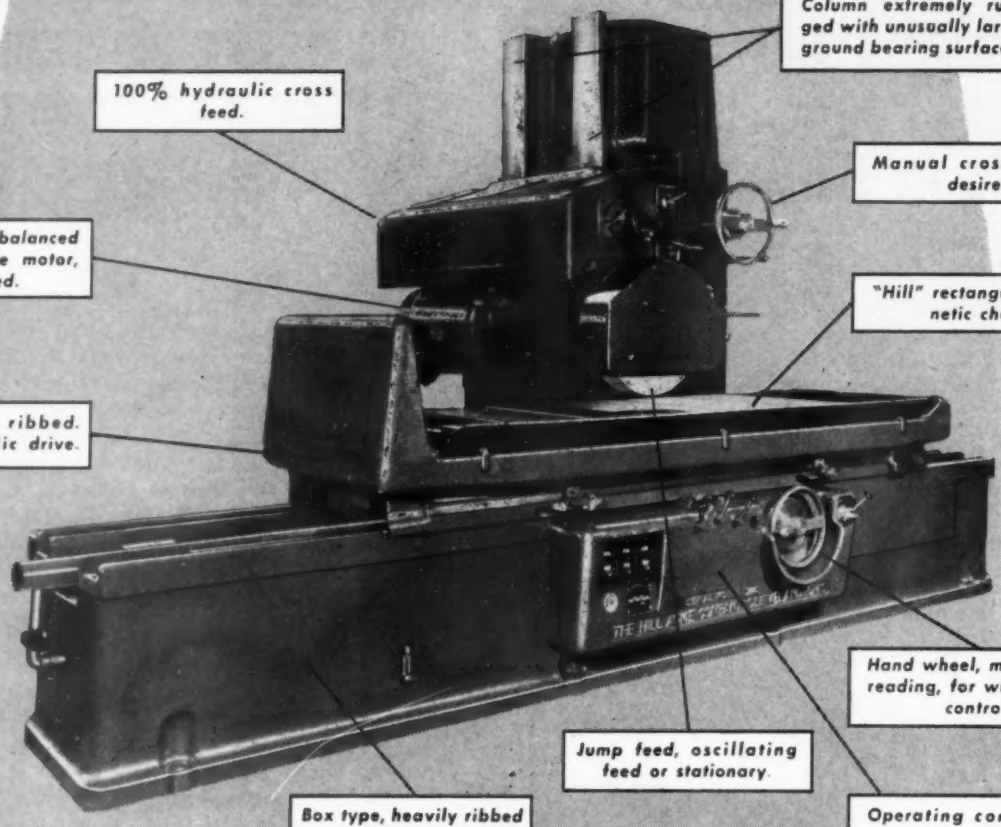
.....

K. R. WILSON

215 MAIN ST. BUFFALO 3, N. Y.

HILL SURFACE GRINDERS

"Open Side" Horizontal Spindle Hydraulic grinders for heavy duty precision grinding. Also built in Vertical Spindle design and in a full range of table widths and lengths.



Column extremely rugged with unusually large ground bearing surfaces.

100% hydraulic cross feed.

Manual cross feed if desired.

Dynamically balanced built in spindle motor, fan cooled.

"Hill" rectangular magnetic chuck.

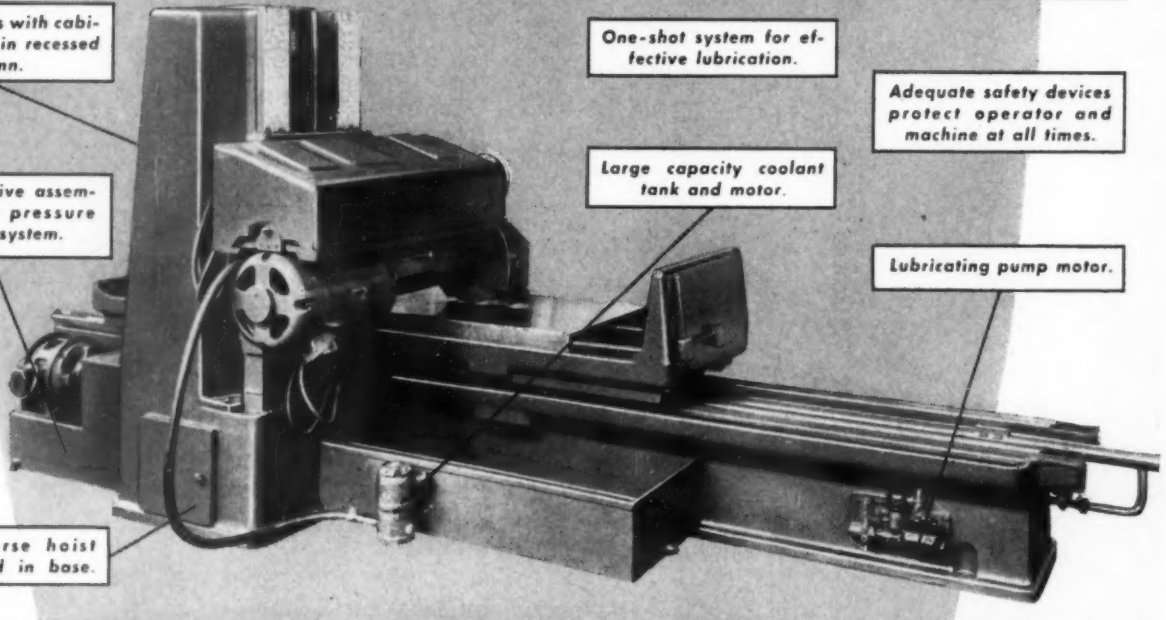
Table heavily ribbed. 100% hydraulic drive.

Hand wheel, micrometer reading, for wheel head control.

Jump feed, oscillating feed or stationary.

Box type, heavily ribbed bed, for rigidity.

Operating controls instantly accessible.



Motor controls with cabinet mounted in recessed column.

One-shot system for effective lubrication.

Adequate safety devices protect operator and machine at all times.

Large capacity coolant tank and motor.

Motor and drive assembly for low pressure hydraulic system.

Lubricating pump motor.

Rapid traverse hoist motor located in base.

THE HILL ACME COMPANY

6400 BREAKWATER AVENUE • CLEVELAND 2, OHIO

"HILL" HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING • TAPPING MACHINES
"CANTON" ALLIGATOR SHEARS AND PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES AND SHEAR BLADES

because they can be depended on for ECONOMY, EFFICIENCY *and* SPEED

All the essential performance qualities demanded in small tools today are met in UNION TOOLS.

Faster cutting, longer life between grinds, accuracy and all-round better performance of these tools are matters of common recognition in plants busy on work where small tools are subjected to the most exacting service conditions.

You, too, can depend on UNION TOOLS for your requirements. Try them once and you'll use them regularly.

THE UNION LINE

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

UNION TWIST DRILL COMPANY, ATHOL, MASS.

STORES—New York: 61 Reade St., Chicago: 11 So. Clinton St., Detroit: 5527 Woodward Ave., San Francisco: 121 Second St., Los Angeles: 524 E. Fourth St., Seattle: 568 First Ave., South.

MANUFACTURING DIVISIONS

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec.

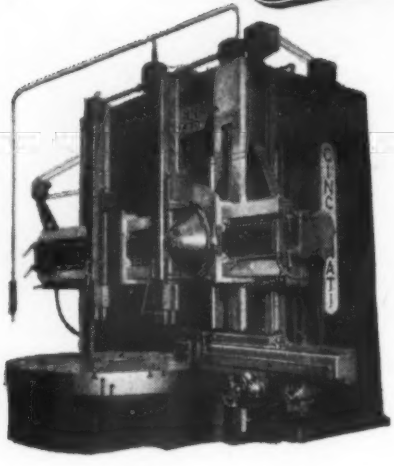
UNION

CINCINNATI

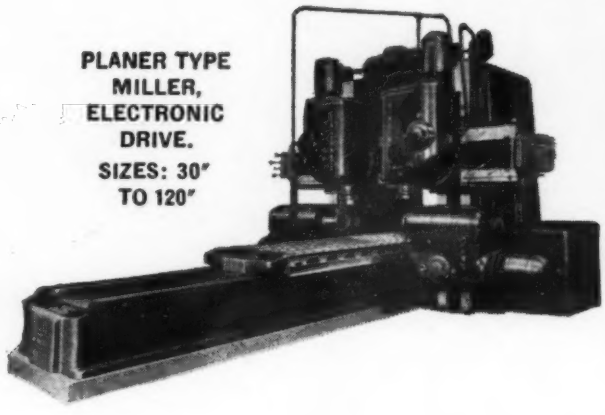
HYPRO

MACHINES

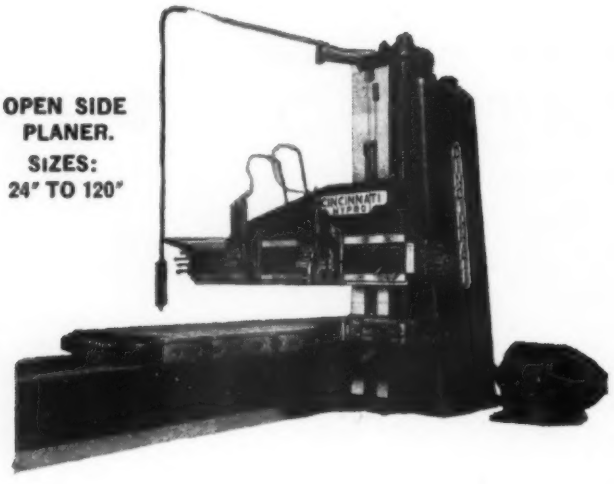
VERTICAL BORING MILL.
SIZES: 54" TO 12'



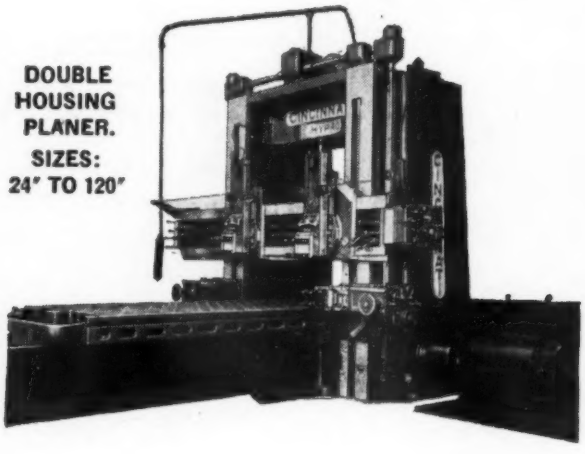
PLANER TYPE MILLER, ELECTRONIC DRIVE.
SIZES: 30" TO 120"



OPEN SIDE PLANER.
SIZES: 24" TO 120"

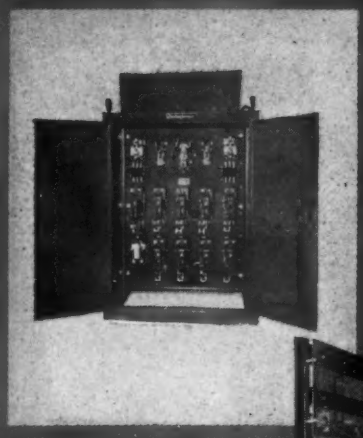


DOUBLE HOUSING PLANER.
SIZES: 24" TO 120"

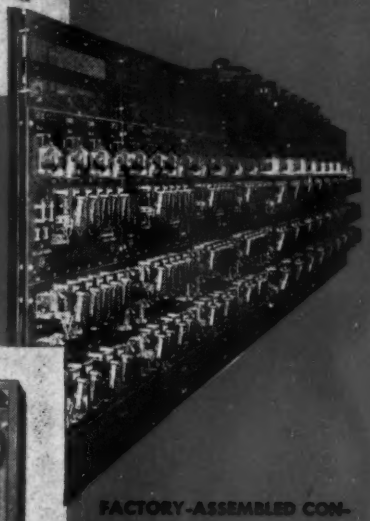


HYPRO IS SHORT FOR HY-PRODUCTION AND A SHORT CUT TO HIGH EFFICIENCY

THE CINCINNATI HYPRO PLANER COMPANY
PLANERS · BORING MILLS · PLANER TYPE MILLERS
CINCINNATI, OHIO

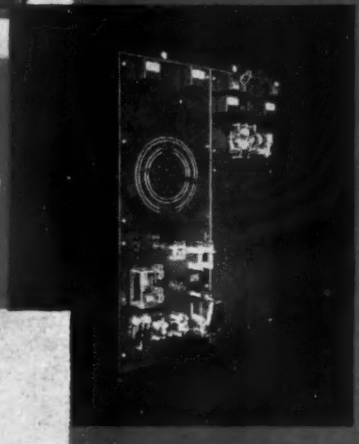


CONTROL for constant-voltage planer drives . . . or other reciprocating machinery, shown at the left.



HEAVY-DUTY CONTROL of magnetic type for constant or adjustable speed motors used in machine tools or other operations requiring inching or jogging, below.

FACTORY-ASSEMBLED CONTROLLERS for steel mill auxiliary service, above.



CONTROL PANEL used with Rototrol for single-motor paper machine drives, right.

DEAD-FRONT TYPE CONTROL PANEL for operation of constant-voltage dynamometers, shown at left.

For any D-C Control

A MOTOR STARTER OR COMPLETE MILL CONTROL

Check Westinghouse

You may never need these specialized controllers shown on this page—for cranes, planers or paper machines—but the same excellence in engineering, design and manufacture goes into every Westinghouse control device. Should your particular problem require special help, call a Westinghouse engineer to review your requirements and make the necessary recommendations.

Westinghouse motor control covers the entire range of standard a-c and d-c controls and accessories for every type of drive, plus many specialized types of control shown here. For help on any control problem, it pays to first call Westinghouse. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60608

Send for this booklet

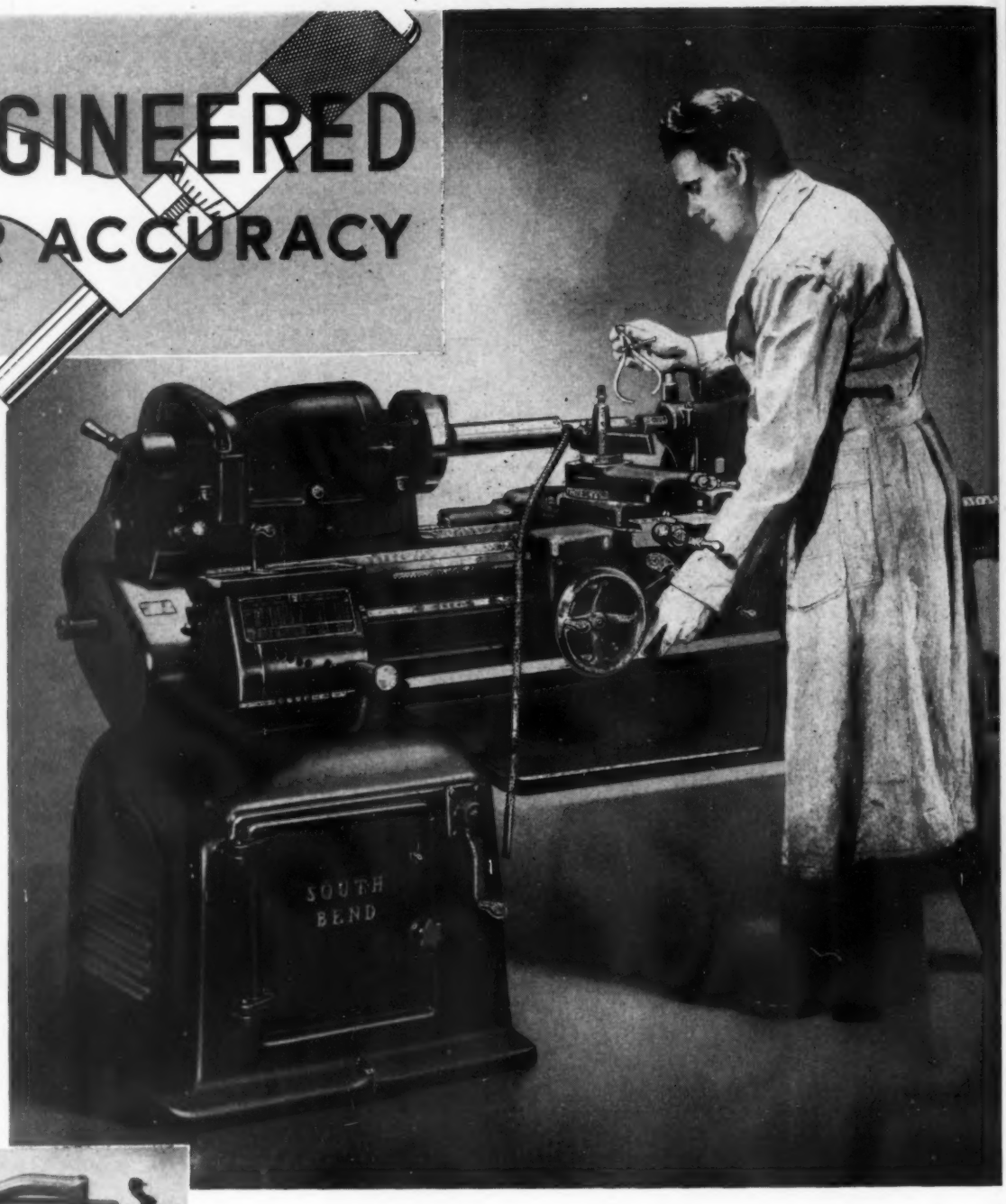
The entire range of Westinghouse standard motor control is covered in this 290-page Buying Data Book. If you do not have a copy, phone your Westinghouse office for Catalog No. 7000.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Motor Control

ENGINEERED FOR ACCURACY



14-1/2" x 5' South Bend Quick Change Gear Lathe. Price, less electrical equipment and chip pan, f. o. b. factory, **$1095.00**

BROADEN THE SCOPE OF YOUR LATHES

South Bend Attachments and Accessories simplify and speed tooling, often save delay and expense of making special fixtures. Shown above is the Handlever Draw-in Collet Attachment. Write for illustrated Catalog No. 77 which shows all South Bend Attachments and Accessories.

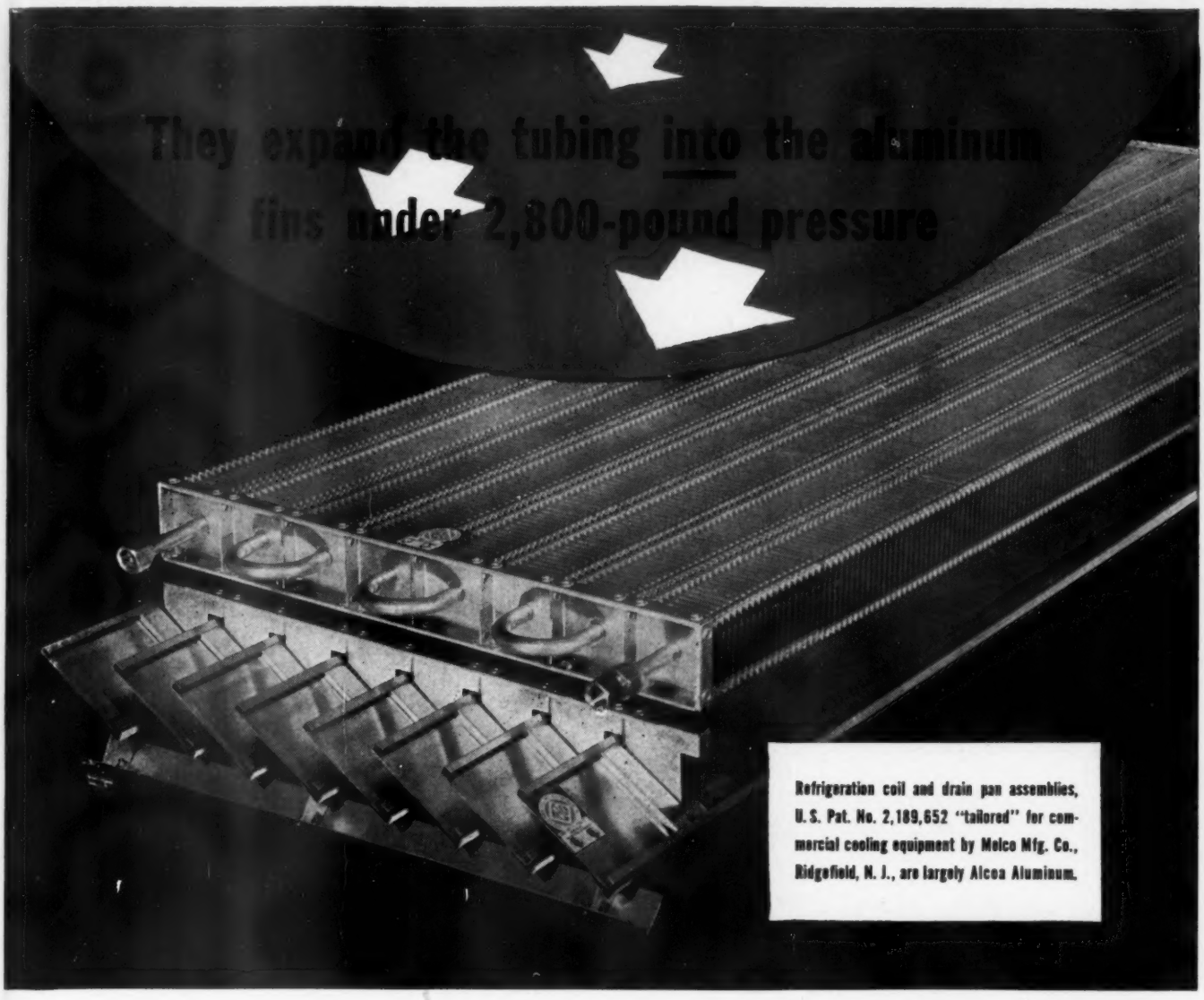
South Bend Lathes are engineered to meet exacting needs for precision accuracy in all types of industries, and to maintain their accuracy year after year, even under strenuous production conditions. Accuracy and long life are built into South Bend Lathes as carefully and surely as they are built into fine timepieces. Correct design based on nearly forty years of research and experience, quality materials specially selected for specific needs, expert craftsmanship, strict inspection through all phases of production and assembly, and thorough testing to rigid working tolerances before shipment, guarantee dependable performance in laboratory, toolroom, production shop, and maintenance department.

South Bend Engine Lathes and Toolroom Lathes are made with 9", 10", 13", 14½", and 16" swings, and bed lengths to 12'. Turret Lathes are made with collet capacities to 1". Write today for free 68-page catalog which illustrates all sizes and models, gives detailed specifications, and shows all attachments and accessories. Ask for Catalog 100-D.

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • • SOUTH BEND 22, INDIANA

LATHE BUILDERS SINCE 1906



Refrigeration coil and drain pan assemblies, U. S. Pat. No. 2,189,652 "tailored" for commercial cooling equipment by Melco Mfg. Co., Ridgefield, N. J., are largely Alcoa Aluminum.

Alcoa Aluminum and a close bond assure rapid heat transfer

Assembling these refrigeration coils hydrostatically has a triple benefit. The tubing is expanded until each aluminum fin is bonded securely, assuring an efficient path for heat transfer. The high pressure tests the coils for soundness and enlarges the tubing slightly between fins, causing a desirable turbulence in the flow of the refrigerant.

Alcoa Aluminum offers a triple advantage in any refrigeration system. It's naturally a superior conductor of heat, so cooling and freezing operations are speeded up. Aluminum lends itself to fabrication in all forms employed by the industry. It is not attacked by Freon and similar refrigerants.

Equipment made of Alcoa Aluminum appeals to the careful buyer. For assistance in incorporating it in your products, call the nearby Alcoa office. Or write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pa.

ALCOA FIRST IN ALUMINUM

IN EVERY COMMERCIAL FORM

BARBER-COLMAN

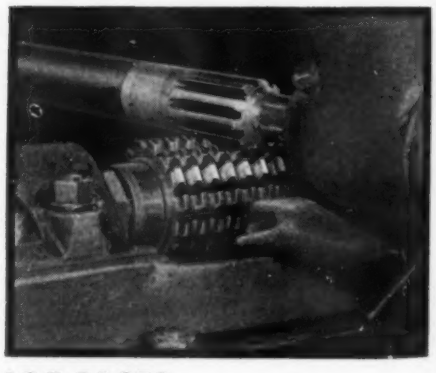
HOBS • HOBBING MACHINES • HOB SHARPENING MACHINES • MILLING CUTTERS
REAMERS • REAMER SHARPENING MACHINES • SPECIAL TOOLS

LONG-BED B-C TYPE "A" HOBBING MACHINE CUTS INVOLUTE DRIVE SHAFT SPLINES TO ±.0005"

There are many long jobs . . . some with only a few inches of teeth or splines to be cut near the end, as in this instance, and others with cuts running the full length . . . which can be machined economically *and accurately* on Barber-Colman Long-Bed Type Hobbing Machines. These machines are exactly the same as the familiar standard types except that the bed and overarm have been lengthened to accommodate longer pieces.

TOUGH MATERIAL — GOOD PRODUCTION

The tough steel drive shaft (SAE 4620 forging) shown here is a good example of the type of work that a long-bed machine can handle. *The root diameter and key width are being held within ±.0005" of specified dimensions and pieces come off the machine at the rate of one every four minutes.* In spite of this strenuous production rate in difficult material, tool life is exceptionally good. Each hob is cutting from 5000 to 8000 shafts. *When production requirements call for high accuracy and high production of extra-length pieces . . . you can be sure of good results by using Barber-Colman Long Bed Type Hobbing Machines.*



JOB FACTS

PIECE. Universal Joint Shaft, SAE 4620 steel forging, 160-220 Brinell, ten keys 2-3/16" long, 1.615/1.625" O.D., 1.332" ±.0005" root diameter, .250" ±.0005" key width, keys must be straight and parallel. Shaft is 37" long overall.

SET-UP. Conventional cut, .137" feed per rev. of work, hob speed 160 r.p.m.; Hob is 3" x 4", taper bore, 7 settings per sharpening, 50-75 pieces per setting, 15 sharpenings.

PRODUCTION. Continuous 24-hour 6-day operation, 120 pieces every 8 hours.

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SHELL HYDRAULIC OIL STOPS VALVE STICKING

PROBLEM: Valves were sticking in the hydraulic control system of an automatic boring machine. Lacquer and gum formations were clearly responsible, but operators could find no way to stop it. Cleaning the system once and sometimes twice each week seemed to be the only way to keep the unit in service.

SOLUTION: When the Shell Lubrication Engineer surveyed the problem, he made two recommendations:

1. A thorough cleaning of the system, following a procedure and using special materials developed by Shell.
2. The use of a Shell Tellus Oil, one of several Shell hydraulic oils specially refined to retard oxidation and rusting.

At the end of two months, no sign of valve sticking had occurred. The operators were reported to be completely satisfied.

CONCLUSION: It pays to consult the Shell Lubrication Engineer, regardless of the nature or size of your lubricating problem. For informative literature on Hydraulic Oils, write Shell Oil Company, Incorporated, 50 West 50th Street, New York 20, New York or 100 Bush Street, San Francisco 6, California.

SHELL HYDRAULIC OILS

SHELL

American Machinist's Spot NEWS OF METALWORKING

Sheet steel shortages have stimulated demand for sheet aluminum. Reynolds Metals' McCook sheet mill is turning out almost 30,000,000 lbs. of sheet a month. More virgin metal is being used in the product now than previously, with scrap making up the balance.

Off-size and heavy gauge surplus materials will be reworked into peacetime products at the brass strip mills, formerly operated by Revere Copper & Brass, and purchased by Garrett Metals Corp. Garrett will spend $1,000,000 on new equipment.

Increased manufacturing costs have forced press manufacturers to increase prices more than moderately. Despite this, demand continues heavy and cancellations are few. Some builders are having trouble getting steel plate.

To increase its pig iron supply, Kaiser-Frazer Corp. has taken a three-year lease on the idle Struthers blast furnace. Promptly put into operation, the old furnace had been idle for a year because OPA prices were inadequate to offset high-cost operations.

Foote Bros. Gear & Machine Corp. is buying $400,000 worth of equipment for the Navy aircraft gear plant in Chicago, which it just purchased for $1,800,000. Its orders for precision gears and gear drives will keep the plant busy through most of 1947. Production will largely go into gas turbine and jet-propelled aircraft.

OPA will permit a moderate increase in steel prices by the year end. The boost will have to offset higher pig iron, coke, and iron ore prices. This extends the upward price spiral, since it will force increases in prices of fabricated steel products.

Reconverted French airplane plants are making aluminum household furniture, railroad cars, busses, and other items. Manufacturers even have American orders for duraluminum suitcases, made from scrap airplane sheets, crinkled in a clever imitation of leather, coated with glue and then spread with wool dust.

Some $10,000,000 worth of machine tool orders have been cancelled in Detroit by the automotive industry over recent weeks, and purchasing departments of auto companies have been told to look for used general purpose machines. Long deliveries on new equipment or deferred changes in auto models are blamed for the step.

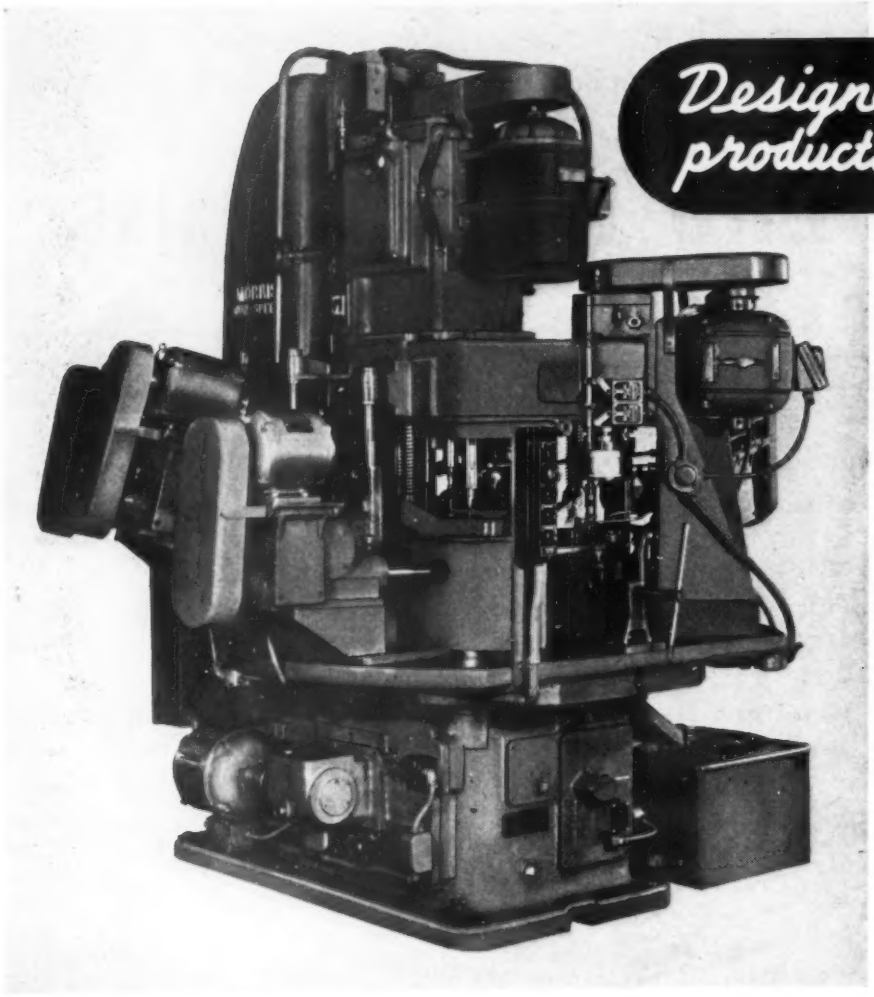
Clark Axle Co., Buchanan, Mich., is planning to build a special booster engine unit that can be mounted behind the cab of a truck. Designed to use a Continental engine, the unit had been in limited production before interruption by the war.

Two Norwegian engineers have invented an electric tractor, weighing less than 900 lbs., powered by a 7½ hp. motor. Manufacturing costs are far below those of gasoline driven tractors.

Iron shortages have been so bad in Detroit that thousands of tons have been purchased from the Fortuna plant on the coast and from Monterey, Mexico. In some cases, the freight has been greater than cost of the pig iron.

Automotive engineers believe that in five to ten years, the smaller high-powered engines will be made of steel, because of their better wearing qualities and simplicity of fabrication. All eyes are on the Crosley "all-steel" engine.

Makers of home heating equipment in the Chicago area are far behind schedule, due to steel and motor shortages. To stretch materials, manufacturers are concentrating on conversion units to be attached to present furnaces, rather than building complete oil, gas, or stoker fired furnaces.



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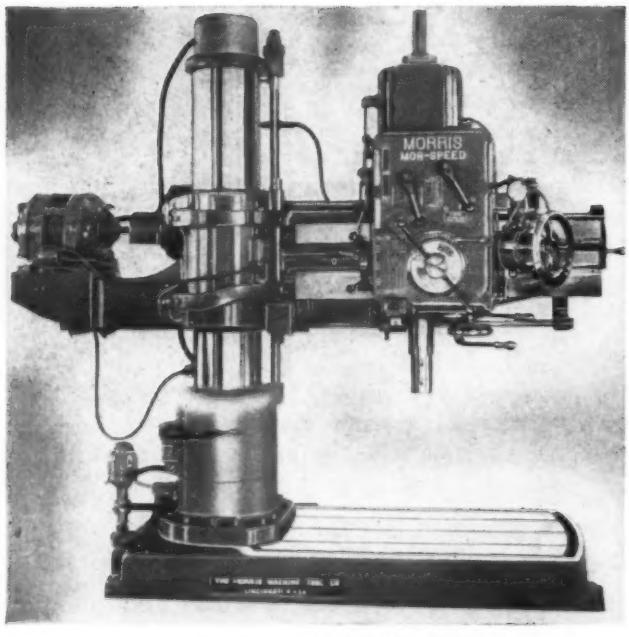
MOR-SPEED
High Production Machine



MORRIS MOR-SPEED RADIAL

This Hydraulic Vertical Six Station Automatic Indexing Machine is arranged for drilling facing, rough and finish reaming, counterboring and tapping holes in auto parts. It is one of three that make up a high production team.

The machine has 8 vertical spindles . . . 2 tap spindles . . . and 5 angular heads each carrying one spindle set at different angles. These angle heads are on a platen—have individual motor drives—and are fed through racks and pinions connected to the hydraulic vertical feed unit. All spindle feeds except the tapping spindles are controlled by the movement of one hydraulic unit. The tap head has individual reversing motor drive with screw thread lead.

It is equipped with 6 double hand load and hand clamp holding fixtures assembled in place on the machine. Nine motors of various capacities are used to power the machine.

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The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

ESTABLISHED 1877

American Machinist

BURNHAM FINNEY, Editor

Plain Talk About Scrap

Scrap stocks at steel mills are precariously low They have dipped so alarmingly that inventories threaten to vanish soon unless something drastic is done to stimulate the inflow.

If steel operations should have to be curtailed because sufficient scrap is not available, it would be a body blow to our industrial production. Leading manufacturers of all sorts of metal goods say that their activities from now on depend in large measure upon the steel tonnage they can secure.

That shows how critical is the need for more scrap. It isn't a case of helping out the steel industry. It is a matter of keeping our national economy going when it counts most in the battle against inflation.

The steel people once again, as in 1942, are asking each and every company in the nation, large and small, to conduct a scrap campaign to uncover any steel or iron scrap which it may possess. Every nook and corner and every department should be combed thoroughly.

While this constructive action is going on, we should like to suggest a sizable source of scrap that has not been tapped. In fact, little has been said about it.

We are referring to the thousands of old machine tools and special-purpose machine tools now in surplus. These machines will be of no practical use to anyone. All they will do is cost taxpayers money by being stored for a long period of time at government expense.

The likelihood of selling these machines is remote. In any event, they would bring a relatively small amount of money.

War Assets Administration is empowered to scrap machines over 25 years old. In addition, it is officially committed to a policy of scrapping machines which cannot be sold, which cannot be used by non-profit educational institutions and which would cost more to be stored than they could be sold for.

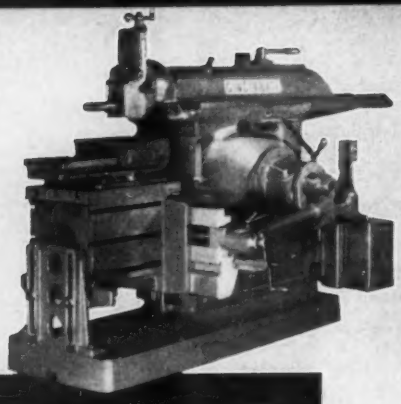
The trouble is that thus far little or no scrapping has been done. The policy is only a noble expression of purpose. It is time that, to use a Washington term, it be "implemented."

Every ton of scrap will aid in keeping steel operations from slumping back to lower levels. In the campaign to get enough, WAA should cooperate fully by scrapping machine tools which should be scrapped. Tens of thousands of tons thus would be added to present meager stocks.

Private owners of ancient machine tools should do their part too. Rather than keep at hand machines which have far outlived their usefulness, they should sell them for scrap. That would serve the best possible purpose. It would be a contribution to the national welfare. At the same time owners would be amply compensated for their old "clunkers."

What better way to help the scrap drive?

Burnham Finney

Use a  SHAPER

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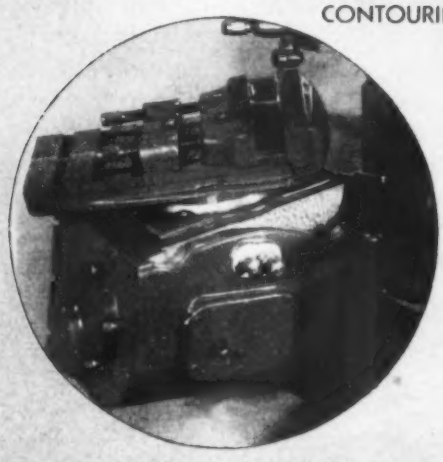

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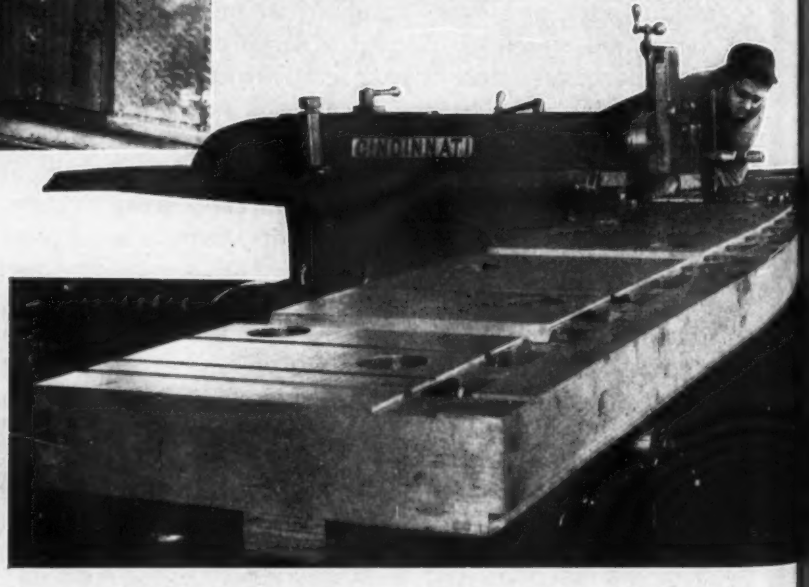

PLANING AND SHAPING

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Cemented Carbides Make Die Materials

This roundup report covers latest experience with the war-developed application of carbides to dies and punches in a number of plants

BY BEN C. BROSHEER
ASSOCIATE EDITOR

SPECTACULAR RECORDS have been made in recent years with carbide-tipped tools for turning, boring, milling, reaming and other metal cutting. Of equal importance, though less publicized, is the gradually increasing use of these materials in metal cutting and forming dies. In fact, some records achieved with carbide dies are more spectacular than those obtained with carbide cutting tools.

Except in the field of wire-drawing dies, hard cemented carbides in punches and dies were considered impractical, until production requirements for war goods in recent years led to more rigid tests. Not all applications were successful, but others resulted in further developments.

In many cases, die life averages 10 to 100 times that of steel punches and dies, better finishes are obtained on the product, there are fewer rejects, and closer tolerances can be held. Usually, greater speed is possible than with steel dies. In addition, carbide dies are out of service less time for die maintenance and servicing. Fewer dies generally are needed for a given operation. Cost of dies, on the other hand, is several times as high as for steel, and presses must be kept in better condition.

Hard cemented carbides have been applied successfully to dies of several varieties, including drawing dies for wire, tubing and bar stock, compacting dies for powdered metals and highly abrasive ceramic materials, dies for cold-swaging or pressure-forming both solid and tubular metal products, cutting dies for piercing and blanking sheet metals and non-metallic materials, punches and dies for drawing, tapering or sizing cylindrical metal parts, and forming dies for sheet metal.

Heading and extrusion dies for shaping and sizing bolts, nuts, screws and rivets also have been made successfully in solid carbide form and with carbide inserts. During the war, carbide cold-nosing dies for high-explosive shell up to 105-mm. proved successful. Production ranged from 1 to 3 million shell per die, as compared with an average of about 50,000 shell for tool-steel dies. Galling, scratching and pick-up were virtually eliminated.

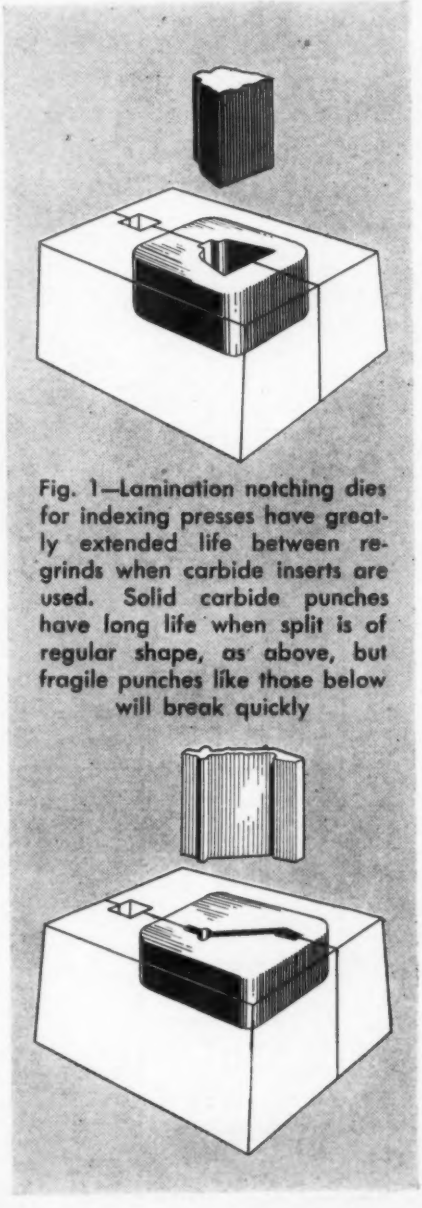


Fig. 1—Lamination notching dies for indexing presses have greatly extended life between regrinds when carbide inserts are used. Solid carbide punches have long life when split is of regular shape, as above, but fragile punches like those below will break quickly

In blanking, notching and trimming dies, outstanding results have been obtained with carbides when the dies have been designed properly and the presses have been maintained so punches and dies are kept accurately in alignment. During the war, for example, a metal-goods company made radio-tube base parts from 0.0095-in. stainless-steel sheet (30% chrome) having a hardness of 87 Rockwell B.

Punching, drawing and trimming dies of conventional die steels required redressing after every 50,000 to 60,000 parts. When cemented-carbide inserts were used in a set of dies, more than 8,000,000 of these tube bases were blanked, drawn and trimmed without reworking the tools.

The General Electric Company has been using cemented-carbide inserts in lamination dies for punching silicon sheet steels with varying success during the past five years. An outstanding example has been the rotor lamination notching die sketched at Fig. 1. Normally made of the best grade of high-carbon, high-chrome tool steel, these punch and die sets averaged about 150,000 slots between grinds.

Application of carbide inserts in the split die and the use of a solid carbide punch has made it possible to run as many as 4 to 5 million slots before objectionable burrs are developed and the dies must be re-

dressed before further production.

Where complicated slot design necessitates an extremely fragile punch construction, in Fig. 1 below, General Electric reports little advantage has been gained by applying cemented carbides. Experiments now under way, using a combination of a high-carbon, high-chrome tool-steel punch and cemented-carbide inserts in the die, are expected to give runs of approximately 750,000 slots between grinds. Such an increase in tool life will make it easy to justify higher die costs where production requirements are high.

O'Keefe and Merritt Manufacturing Company report a 50-fold increase in punch and die life, together with elimination of burrs, with the use of a split cemented-carbide stator lamination punch and die set made of solid carbide.

In both types, die blocks are designed to be clamped between key or matrix blocks on the die shoe. They are sharpened by grinding metal off the top and relieving each half of the die to maintain the correct size. Only the sides of the dies have clearance; the ends are straight. The face of the solid carbide punch is concave, giving it a shearing action and reducing the load on the punch.

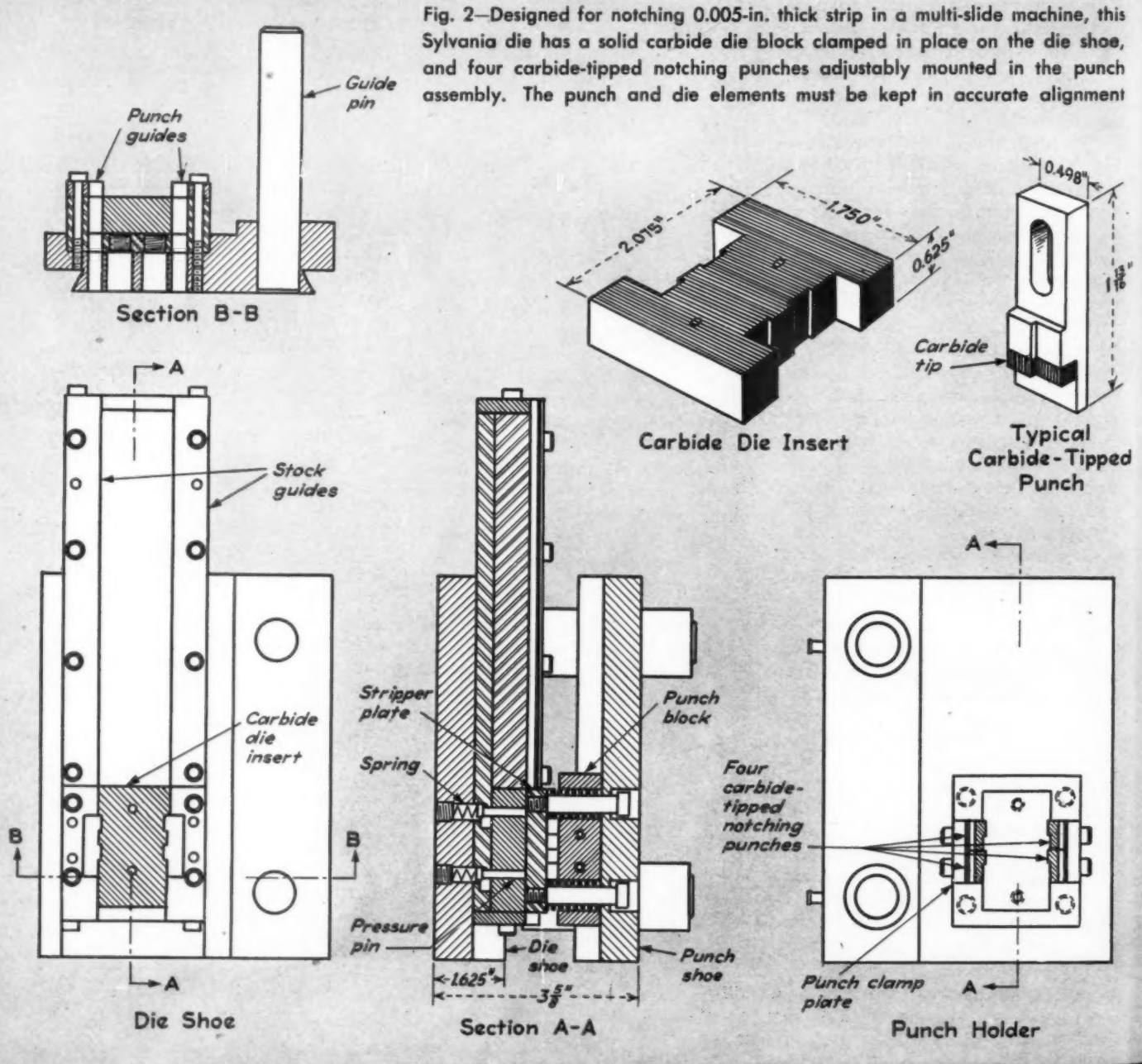
The O'Keefe and Merritt die is used for piercing lamination disks 0.016 to 0.018 in. thick having a 2.50% silicon and 0.12% carbon content. Before piercing, the steel is heat-treated to produce a tight scale having valuable insulation properties, but which materially increases the abrasiveness of the stock.

Piercing is done without lubricants in an indexing press operating at up to 600 strokes per min. Production records show conventional steel dies lasted for about 46,000 hits between grinds. Cemented-carbide dies now last for 1,600,000 to more than 2,300,000 hits before redressing is necessary. None of the carbide dies in use at this plant have as yet worn out, so total life cannot be computed.

Sylvania Electric Products has been using tungsten-carbide parts in press dies for the past three years, and from 50 to 75% of the dies constructed include carbide parts. Dies are used to pierce or form 0.005-in. thick stock and are made to close tolerances. The punch must be kept aligned exactly with the die elements. Poor alignment causes the cutting edges to chip almost immediately.

Sylvania tool engineers claim that

Fig. 2—Designed for notching 0.005-in. thick strip in a multi-slide machine, this Sylvania die has a solid carbide die block clamped in place on the die shoe, and four carbide-tipped notching punches adjustably mounted in the punch assembly. The punch and die elements must be kept in accurate alignment



clamping the carbide elements in place is superior to brazing the carbide to the steel, but in all too many cases brazing is necessary for holding tips in place. Brazed tips usually are satisfactory only when punching thin stock, as for radio-tube parts, but the brazed joints break down rapidly when heavier stock is punched, permitting the carbide pieces to loosen and shift or fall off. Press tools using carbides can be run at somewhat higher speeds than conventional die-steel tools. This increased production reduces labor, overhead and maintenance charges. The material cost and time required to build such tools is greater than with steel, of course.

A four-punch notching die, Fig. 2, for use on a multi-slide forming machine has a solid carbide die insert held in place between two steel clamp blocks which also serve as guides for the four carbide-tipped notching punches. The carbide-die insert has two 0.156-in. dia. lapped holes to clear two spring-loaded pressure pins which extend vertically through the die assembly to hold the strip stock slightly above the carbide insert while the stock is being fed through between strokes.

Well-Guided Punch

Each punch is made of tool steel, hardened to 62-63 Rockwell C, and ground all over. The carbide tip is brazed to the punch. Punch shanks have a lip extending approximately 1/8 in. below the carbide tip so the punch will be engaged in its guide slot before the carbide strikes the work. Each punch is slotted for vertical adjustment on the punch block. Under this block is mounted a heavy, spring-loaded stripper plate carried on two large die screws. To maintain accurate alignment of the punches with the die insert, the die shoe carries two large guide pins engaging in guide bushings in the punch shoe.

Cemented-carbide inserts have been used successfully by General Electric in form dies for stainless-steel parts, where finishes are critical. Where former tool-steel dies needed polishing after about every 2,000 parts, carbide inserts in dies like those shown at *A* and *B* in Fig. 3 have increased this value to approximately 15,000 parts between redressing operations. As indicated at *B* in Fig. 3, carbide inserts are advantageous in dies where the contour of the formed punching must

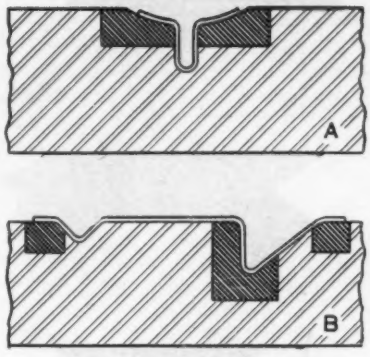


Fig. 3—Carbide inserts help increase tool life many times when used at wear points in forming dies. General Electric reports an increase of about seven times in life between redressings when such inserts are used in dies for forming stainless-steel parts. While good results are obtained in simple form dies like that shown at A, savings are more spectacular in more complicated forming tools, as at B. Usually, the inserts are brazed

be held to close tolerances, and the parts are given a 100% check on inspection fixtures.

A progressive die, Fig. 4, for notching, piercing and forming top shields for a radio tube consists of nine pieces of cemented carbide, each silver-soldered onto a punch or die member. Largest carbide part is the main blanking-die section which, when finished, is 0.800 in. long, 0.519-0.520 in. wide and 7/32 in. thick. It is silver-soldered on top of a piece of tool steel hardened to 62-63 Rockwell C and the assembly is held to a height of 0.687-0.688 in. Mated with this part is the rear blanking-die section, on which

Production Between Die Sharpenings on Radio Tube Parts

Part	Conventional Tool-Steel Dies	Dies Having Carbide Inserts
A	50,000	5,000,000
B	40,000	3,000,000
C	40,000	3,000,000
D	80,000	10,000,000
E	15,000	10,000,000
F	40,000	8,000,000
G	50,000	8,000,000
H	100,000	15,000,000
I	80,000	18,000,000
J	60,000	12,000,000
K	100,000	15,000,000

From 50 to 75% of dies built during past three years have had carbide parts. Time required to build such tools is somewhat longer than with steel, but in large runs this can be permitted because of economies in maintenance of die sets having carbide inserts. Most of these tools are used to pierce or form 0.005 in. thick stock. *Courtesy Sylvania Electric Products, Inc.*

are silver-soldered two small carbide blocks. The tool steel portion of this part is hardened to 60-61 Rockwell C before grinding. The front and back notching punches are tool steel, hardened to 60-61 Rockwell C, and ground all over. Each has a 1/8-in. thick carbide cutting face ground to fit the contour of the assembled blanking-die sections within plus 0.0000, minus 0.0002 in.

The 0.092-in. dia. piercing punch has a 1/8-in long carbide tip silver-soldered on for a cutting surface. This tool-steel punch is 1 17/32 in. long, hardened to 55-58 Rockwell C and ground all over before tipping. The 0.092-in. dia. tip is fitted to the 5/16-in. O. D. and 3/16-in thick carbide piercing-die insert in the die block within plus 0.0000, minus 0.0002 in. Small size of the punch tip, as well as the fact it is carbide, make it essential that punch and die be aligned perfectly.

Soldered to Hardened Steel

In the final die section, the top shield is cut from the strip and folded to form a channel section. Meanwhile, tabs at each end are bent down to finish the part, which is blown out of the die with an air jet when the die opens. The combination tab former and cutter, as well as the cut-off block have carbide-cutting inserts, silver-soldered onto the hardened tool-steel pieces. Both of these steel parts have a hardness of 55-58 Rockwell C. To insure clean cutting, and to help in the tab forming operation, the upper cutting member is beveled at 15° on the cutting edge. The lower member is ground to a 90° cutting edge.

Designed to pierce and notch razor blades from 0.004-in., 0.882 in. wide high-carbon strip steel in a soft state, a die set recently made by Barth Stamping & Machine Works incorporates 41 pieces of cemented carbide. In this tool, two notching punches, the center contour punch, two rectangular pilot pins and four shaped die blocks are all of solid carbide. Other carbide members in this tool include stock guides, guide-post bushings, and wear-strip inserts for the guide posts. This die already has pierced and notched almost 2,000,000 blades without resharpening. The burr condition has not shown any appreciable increase during this time and is estimated at only 0.0002 in. A typical tool-steel die for the same blades usually must be redressed after each 100,000 to 125,-

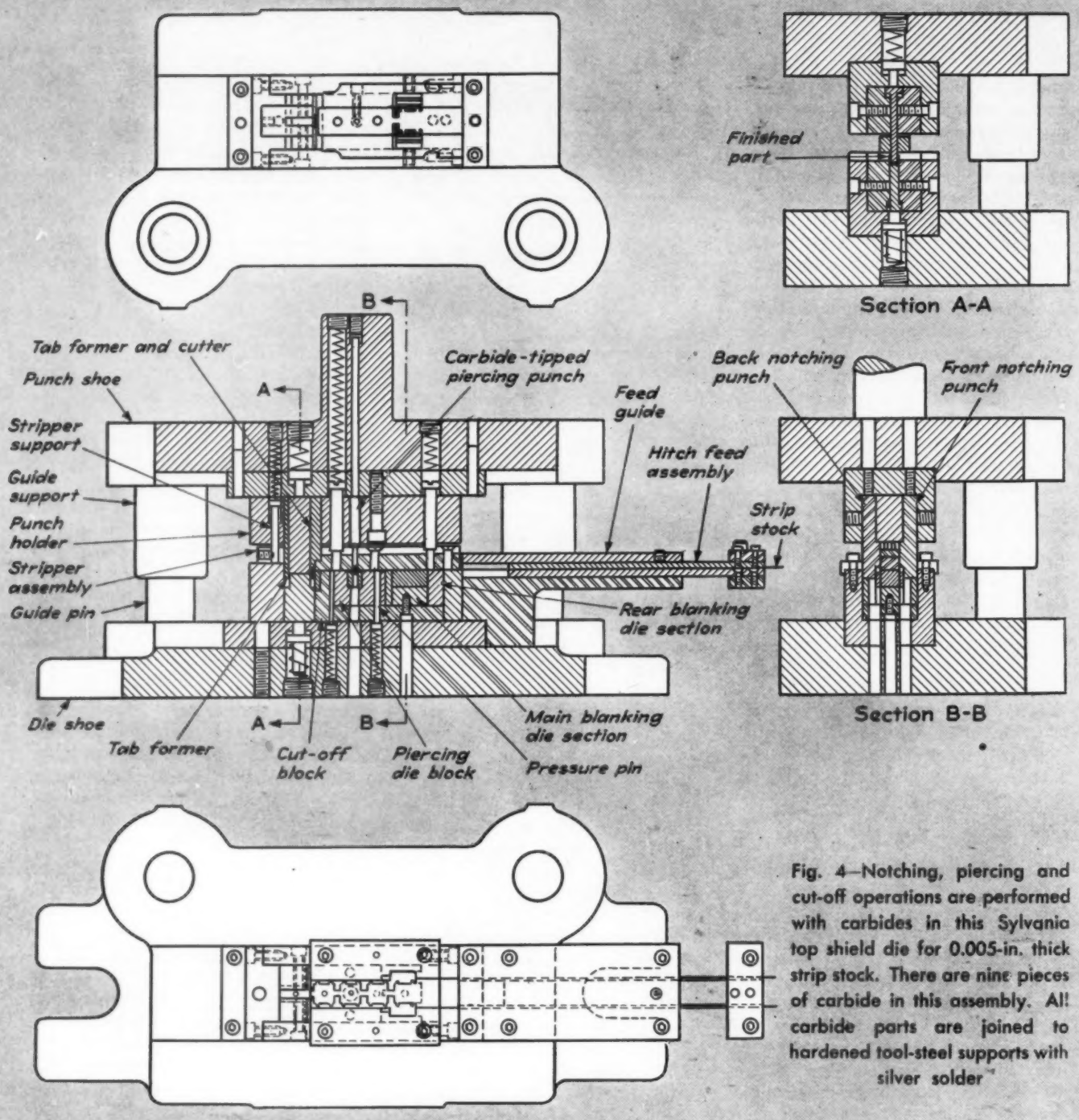


Fig. 4—Notching, piercing and cut-off operations are performed with carbides in this Sylvania top shield die for 0.005-in. thick strip stock. There are nine pieces of carbide in this assembly. All carbide parts are joined to hardened tool-steel supports with silver solder

000 hits, and will produce about 15 million blades during its normal life.

Carbides found considerable application in the construction of dies for drawing and tapering both brass and steel cartridge cases during the war. Today, carbide draw dies are being used with considerable economy in tool cost per piece produced for the manufacture of small cylinders for storing gases under high pressures, kitchen utensils, containers for dry cells, flashlight cases, food and beverage cans, headlight reflectors, hub caps, cigarette cases and cosmetic containers, camera parts, and refrigerator parts.

Material being drawn includes carbon and alloy steels, brass, copper, aluminum, magnesium, gold and silver. Sylvania Electric Products has used carbide draw dies on nickel and reports they do not build up with nickel as do steel dies. This reduces down time for die repairs.

Before the war, the largest carbide die for deep-drawing sheet metal had an inside diameter of about 4 in. Today, carbide deep-drawing dies as large as 13 to 15 in. I.D. are in production service.

General Electric has obtained excellent results from the use of cemented-carbide inserts in high-production draw dies, especially where part design and tolerances are critical. In the production of the refrigerator muffler shell, Fig. 5, for example, the maximum production obtained between die repolishing operations at the critical point was about 60,000 parts when the best grade of high-carbon, high-chrome tool steel was used.

This part is made from 0.030 in.

thick deep-drawing steel, and both copper-plated and unplated stock was used without affecting results materially. However, when carbide draw rings were used in the die, approximately 700,000 parts were run before the die required polishing. This was done with a tool-steel punch, using standard unplated deep-drawing steel stock. Similarly, other tools produced approximately 500,000 refrigerator shells from 0.060-in. thick deep-drawing steel between die polishing operations. Before the carbide draw ring was inserted in the die, about 30,000 parts were produced per die polish, and the die had a total life of only 160,000 to 200,000 parts. Extremely close tolerances must be held on this part.

Less Finishing on Parts

The DeLaval Separator Company advises that smooth parts without scratches are being produced in their carbide draw dies, and therefore less time is required for finishing operations. Die life is longer because of reduced wear on the dies and reduced polishing.

While the initial cost of such dies usually is three to four times higher than that of all-steel dies, the company expects to save the extra cost within a few months. Officials point out it is important to design the dies with the proper thickness of carbide inserts, and with sufficient steel backing to withstand the strains and shocks to which they will be subjected. Fig. 6 shows the cross-section of a ring for a draw die having a carbide insert for drawing a part similar in shape to that shown in Fig. 5, but with smaller dimensions and drawn from 0.050-in. thick stainless steel sheet.

With this die ring, a total of 15,000 parts have been drawn to date without the die requiring any maintenance and without noticeable change in the condition of the die surfaces. A tool-steel die for the same part produced 800 pieces before wearing oversize, and in that time required 3 hr. of attention from die maintenance men. A nickel-iron die lasted for 2,000 pieces before wearing oversize and required 1.5 hr. for tool maintenance.

Compacting dies for powder-metal parts must have sufficient hardness to resist wear, and must be strong enough to withstand high pressures. Forming dies having cemented-carbide liners are maintaining hole sizes 25 to 50 times longer than is possible with steel dies, according to service reports. High polish on the liners helps reduce the friction set up during the pressing or "tableting" operation.

Products now being compressed in such dies include oil-less bearings, gears, cams, carbide blanks, diamond wheels, refractory wheels, carbon products, magnets, sparkplugs, filters and bushings. Types of materials being compressed include powder metals, porcelain and clay.

General Electric Company is using cemented carbides to advantage in making molds for compacting ceramic materials. The compounds being molded are extremely abrasive, and tools made of the best high-carbon, high-chrome tool steels were not satisfactory because of high maintenance cost and frequent interruptions in production.

To make use of cemented carbides in these compacting molds, it has been necessary to resort to a complicated split die design, Fig. 7. However, excellent results have been obtained and production has gone up from as low as 700 parts with tool-steel molds to as high as 100,000 parts with cemented-carbide inserts in the molds, before mold repairs are necessary.

Limits for Stock Thickness

Great strides have been made in applying carbides to press tools. But this does not mean that these materials can be used in every punch and die set. Each application must be studied to determine its suitability for one or another grade of available carbide material, and for the economic justification of the higher cost of carbide dies.

Shock-resistant grades of tungsten carbides have, to date, shown the best results. And these results have, in general, been obtained with dies designed for simple shapes. Development work on parts of complicated shape is going forward and interesting results are to be expected in the future. So far, best results have been obtained when blanking or piercing steels and other metals in thicknesses under about 0.025 in., although considerable experimental work has been done in the development of tougher, stronger and more shock-resistant carbide materials so they can be adapted to more severe blanking and piercing operations up to approximately 3/8 to 7/16 in. thick plate.

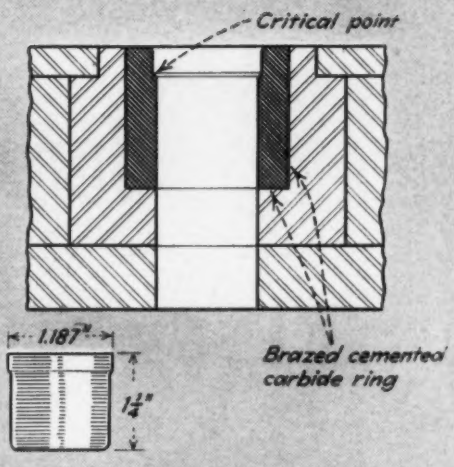


Fig. 5—Use of carbide draw ring in this combination draw and form die for a refrigerator muffler made it possible to increase to 700,000 the number of parts finished between repolishing operations. With hardened high-carbon, high-chrome tool steel inserts, maximum production between dressings was about 60,000 parts

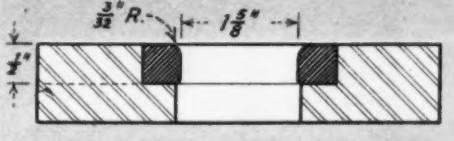


Fig. 6—Used for drawing a cup from 0.050 in. thick stainless steel, this carbide draw ring finished an order for 15,000 parts without requiring any maintenance. A tool-steel die for the same part lasted for only 800 pieces before wearing beyond allowable limits, while a nickel-iron die made only 2,000 pieces before failure

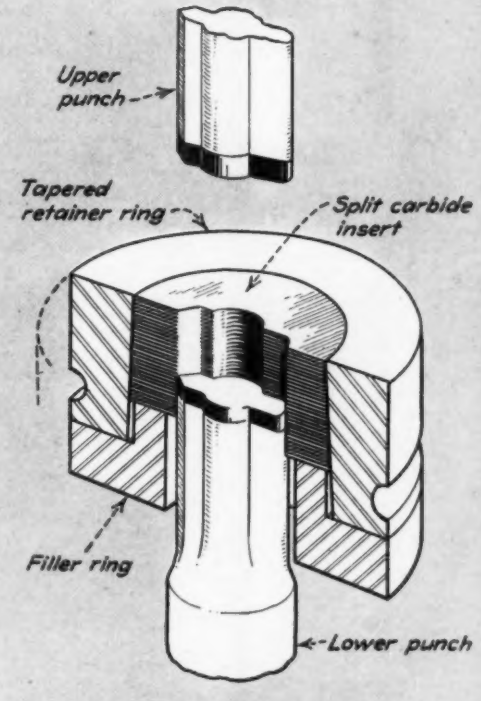
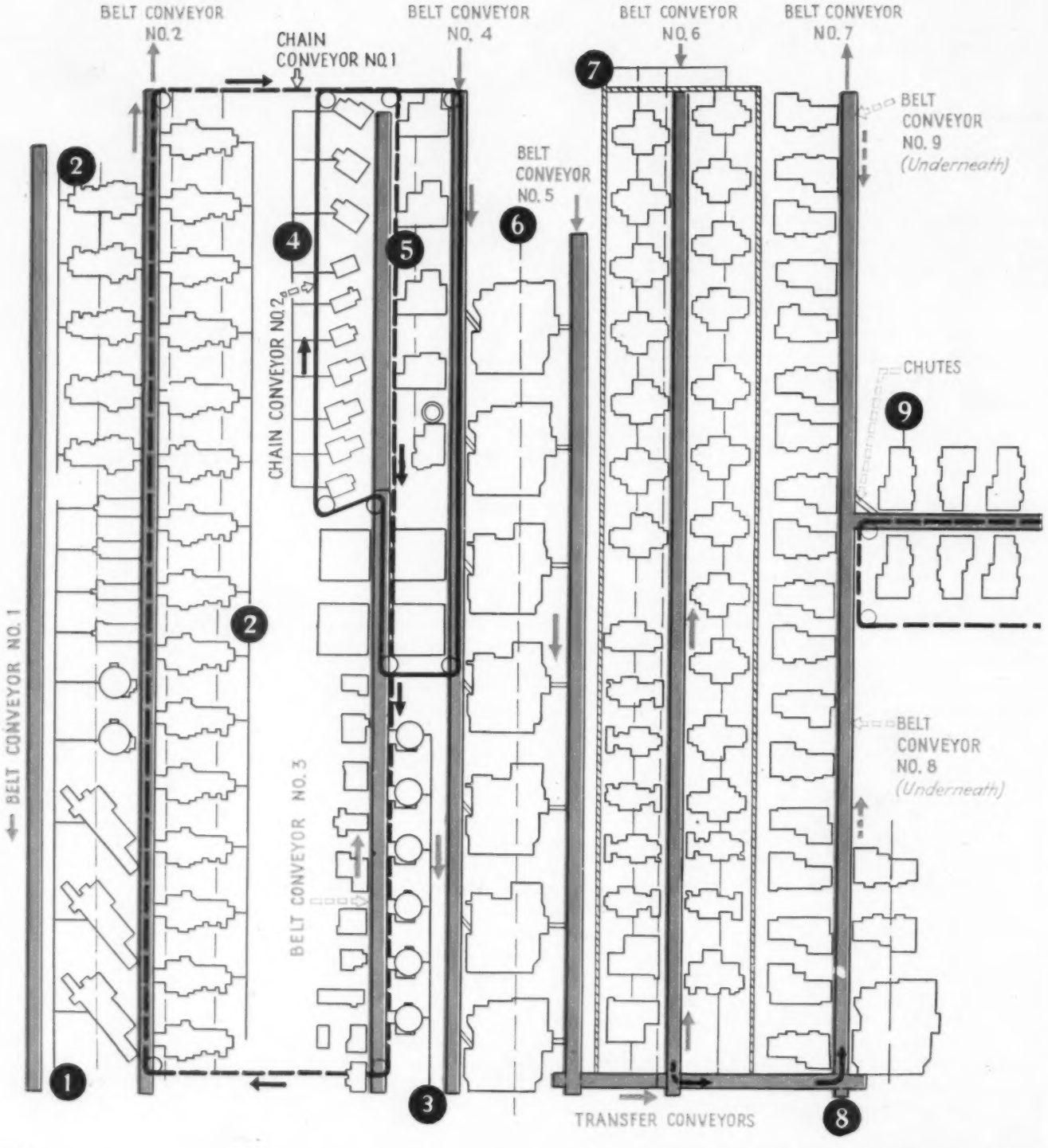


Fig. 7—Carbide compacting molds last well, even when working with highly abrasive ceramic compounds. Usually, split dies are necessary for these materials

Conveyors Increase Efficiency of FORD PISTON LINE



A SHUT-DOWN for lack of materials gave the Ford Motor Company an opportunity to install a system of belt and overhead chain conveyors in the piston-machining department. The change from skid boxes was motivated by a desire to reduce the manual effort required to load and unload machines. Operators now handle pistons with a minimum of body movements, and there is no reaching above shoulder height. Means are also provided in the system to handle pistons for both the six- and eight-cylinder motors on the same line and to keep them segregated without attention. Results already apparent to management are:

1. Departmental efficiency has increased 25%.

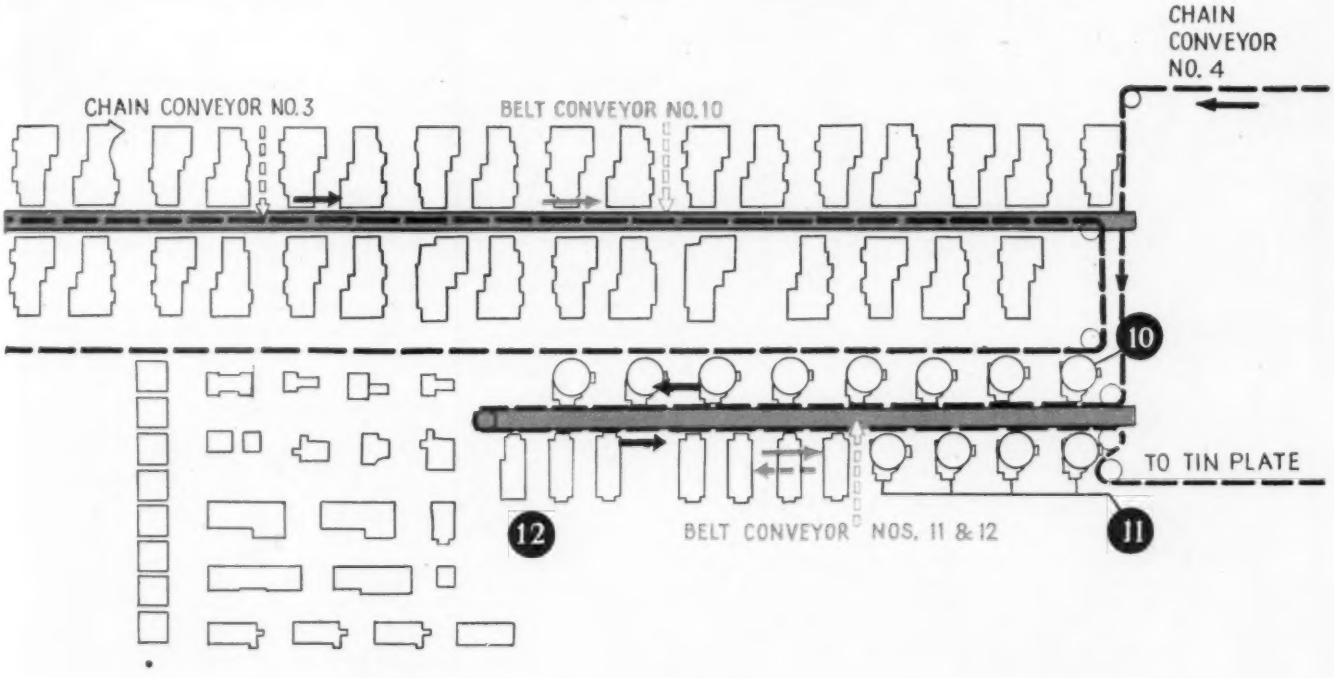
2. Operators approve the change, like the easier rhythm of body movements, are glad to see production mount.

3. The supervisor can see trouble at a glance because loading of the conveyors is self-evident.

4. Nicking of pistons is virtually eliminated because there is practically no danger that they will be dropped on the floor.

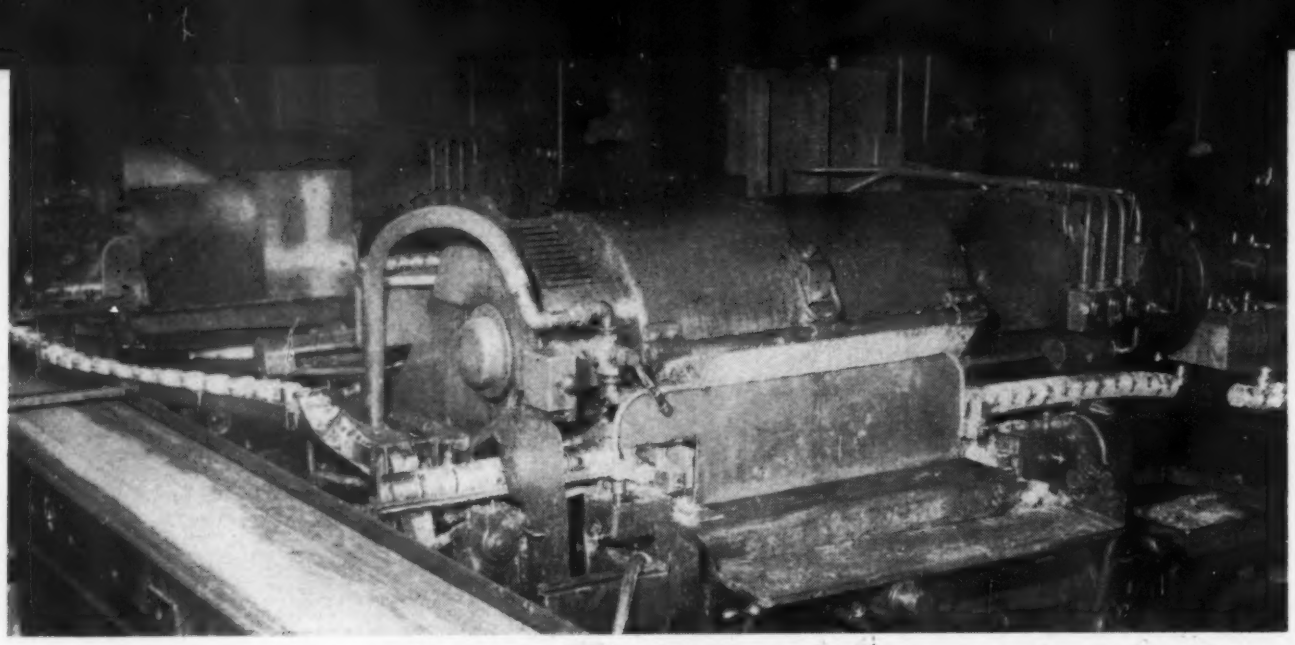
Details of how the system works are given in the table of operations.

OVERHEAD CHAIN CONVEYOR at convenient reaching level brings pistons to the milling operation. After milling, the operator places the pistons on belt conveyor No. 4 which carries them to the centerless grinders set up for that piston size. Six- and 8-cyl. pistons are carried on the same belt, but are separated by guides which avoid mistaking one for the other.



Reduced operator effort is the reason for success of these conveyor installations at Ford. Pistons are removed from and replaced on the conveyors by normal arm movements

Next page, please →



CHUTES take pistons from belt and lay them on their side for passage to the workrest of the centerless grinder

OPERATION SHEET AND HANDLING METHOD FOR FORD PISTONS

	OPERATION	METHOD OF HANDLING	
NO.	DESCRIPTION	TO MACHINE	FROM MACHINE
1	Counterbore and face skirt (Temporary operation to be combined with operation 2)	Operator removes pistons from belt conveyor No. 1. This conveyor is hand loaded from 2000-unit containers.	After completing operation No. 1, the operator places piston on belt conveyor No. 2 traveling oppositely.
2	Turn O. D. and dome, rough and finish ring grooves	Remove piston from Belt No. 2. Note: Chips fall into conveyor which discharges onto slat conveyor which lifts them to air blast for discharge into gondola car.	Place pistons on hanger on chain conveyor No. 1. These hangers are set at approximately shoulder height for shortest man and travel directly above belt conveyor No. 2.
3	Drill 8 oil return holes in 4th groove	Take pistons from chain conveyor No. 1.	Place on belt conveyor No. 3.
4	Balance for weight	Remove from chain conveyor No. 2.	Replace on chain conveyor No. 2.
5	Saw 2 horizontal slots and mill clearance	Remove from chain conveyor No. 2.	Place on belt conveyor No. 4. Gates at the several milling machines are preset to cause the 6- and 8-cylinder pistons to track in lanes on the belt.
6	Rough grind O. D.	At centerless grinders, gates on belt No. 4 direct proper size piston into chutes that lay piston on side before reaching workrest. Pistons feed automatically into machines.	Gravity chute discharges centerless-ground pistons onto belt conveyor No. 5. Gates on conveyor cause 6's and 8's to track in separate lanes. Belt No. 5 discharges onto transfer conveyor leading to belt No. 6.
7	Bore wrist pin hole. Note: In a new setup, chute on conveyor will drop piston into hopper of automatic machine; after machining, piston will be ejected into chute leading to belt No. 6	Remove from top surface of belt conveyor No. 6 and place in machine by hand.	Place bored piston on bottom of belt No. 6 for delivery by means of gate to transfer conveyor leading to belt conveyor No. 7.
8	Semi-finish the ring lands by centerless grinding	Belt No. 7 delivers pistons to trays containing 20 or more pieces, guides on belt direct piston to proper machine.	Belts 8 and 9 under Belt 7 run in opposite directions and toward center of machine line. Operators place ground pistons on these belts.
9	Cam grind O. D.	Belts 8 and 9 discharge to double belt No. 10 by means of a system of chutes. Operators take segregated pistons from double belt No. 10.	Cam ground pistons are hung on chain conveyor No. 3.
10	Cut wire retainer groove in pin hole	Pick pistons off chain conveyor No. 3.	Put on belt No. 11.
11	Burr and clean ring grooves	Take from belt No. 11.	Put on belt conveyor No. 12, beneath No. 11 traveling oppositely.
12	Mill side relief	Remove from belt conveyor No. 12.	Hang on chain conveyor No. 4.

FORD PISTON LINE CONVEYORS

(Continued)

CHUTES carry rough-ground pistons to belt conveyor No. 5. Guides at the ends of the chutes cause pistons for 6- and 8-cylinder engines to ride the belt on separate tracks

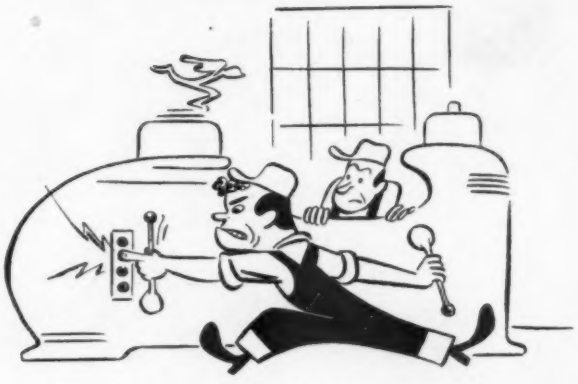
At the delivery end of belt conveyor No. 5, a transfer conveyor takes the pistons to belt conveyor No. 6 at center of photograph. Wristpin holes are bored on machines at left, then placed on bottom of belt, which discharges to a second transfer conveyor (inclined), right rear

At left background, the inclined transfer conveyor discharges onto belt conveyor No. 7 serving the ring-land grinders. Gates direct 20 or more pistons into trays at each machine. When a tray is full, oncoming pistons move to next machine. Gates are set to take either 6's or 8's. Ground pistons are put on belt conveyor No. 8, which runs below No. 7

Machine Tools of Tomorrow—1

DESIGN FOR FUNCTION

BY DR. GOSTA R. TRUEDSSON
CONSULTING ENGINEER AND PHYSICIST

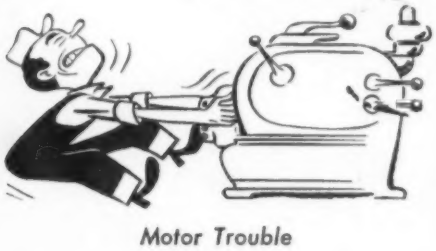


Touché !

THIS GREAT PERIOD of creative activity, in a changing civilization, is not without its growing pains. Like the Greeks, we find ourselves in sympathy with the stark functional simplicity, with the perfect integration of parts we see today in some of our products. A disproportion or an elaboration beyond the essential produces a shock to our sensibilities. With growing discretion, the modern manufacturer realizes that this forthright attitude has won a way in the world, and that a poorly designed and styled product goes to market with a handicap.

Our fumbling progress toward rational form in machine tools has often resulted in a mistaken identity of "streamlining" for function. Instead of designs controlled by principles of scientific engineering and rational solutions of the essential characteristics, we often see machines inflated by forms without meaning. This frequently results in increased cost of construction, and more frequently increases the difficulty of operation and maintenance.

While some manufacturers have recognized the new order, others have been so engrossed with the idea of streamlining their products that vital points of design have been relegated to a position of secondary



Motor Trouble

Since the advent of the era of industrial design, or "styling," machine development has become a compound problem involving both mechanical function and art

importance or sometimes entirely neglected. It has not been an uncommon practice to set up rigid rules for the size and shape of the external shell, before even giving a thought to the functioning of the machine or the possibility that it may require servicing of its various mechanisms.

Some of the largest machine-tool users have repeatedly requested certain features in the machines they buy, and have offered an abundance of suggestions for simple improvements, based on a wide experience with manufacturing and maintenance problems. But we have yet to see a majority of "postwar" designs embodying even a small percentage of those excellent suggestions. Machines are still being designed with motor drives in the most inaccessible places, without provisions for lubrication or removal of the motor, except by methods involving considerable loss of time and accompanied by great difficulties. The tendency to strive for streamlining in the product, at any price, is often responsible.

Electric controls are often exposed to coolant or cutting fluid and so close to the floor that any servicing of the controls becomes an extremely hazardous venture. The disorganized array of hydraulic valves and piping in inaccessible places often requires almost complete dismantling of the machine to remove a small unit for servicing. Machines of one make and function are often designed with as many different hydraulic systems as there are sizes and models, with complete disregard of the complications sure to ensue when field service personnel are confronted with the necessity of mastering the intricacies of the various systems.

The question of chip disposal on machine tools is often left entirely up to the user, as if it were a problem too elementary in nature for the designer to think about when planning the functions of the machine. Operating controls of the machines are often in scattered places, requiring an operator with the dexterity of a ballet dancer.

Poor judgment in design may result in misunderstanding the contemplated results; as, for example, machines embodied with elaborate entasis curves, which instead of giving emphasis to the solid form of the machine, produce the effect of an extremely poor casting job. Or where a swinging electric control panel, of the jack-in-the-box type, is resorted to in order to obtain "streamlining," even if it means saddling the machine with a new item of very questionable reliability.

What has not yet been generally accepted is the point that there is beauty or esthetic value in functional form, be it motor, control box or control lever. Thus, a machine designed to emphasize these units, instead of hiding them in a casket-like shell, will properly accentuate the relationship between these ele-

ments and will, by skillful proportioning, produce a sense of single theme or motive in the design.

Many of these pitfalls may be avoided at an early stage of design if three-dimensional scale models are employed. Perspective drawings, which portray in simple fashion the major structural details and made concurrently with the engineering layouts, enable all concerned to obtain a clear and concise picture of the machine and may be used as a guide in scrutinizing the design for possible critical points, otherwise easily overlooked.

Whenever a prototype machine is available, photographs of installation and assembly operations may be used to excellent advantage.

Information to be gained from motion study should not be overlooked. Controls for the machine should be located so the operator is in a normal posture and to make necessary motions as few and direct as possible. Unproductive elements should be eliminated. Obviously, no haphazard informal consideration will produce the results of a systematic motion study, and benefits that may be gained therefrom should be taken advantage of in the development stage.

These processes may be called, in typical engineering vernacular, "trouble shooting in advance," or, borrowing a term peculiar to the medical profession, "prognosis" of the functions and characteristics of the machine. The methods are equally applicable to all types of machines and production equipment.

The large-scale commercial development of new materials and synthetic products has resulted in much confusion to the average engineer or designer whose time is pretty well occupied in keeping up a speaking acquaintance with their peculiarities and limitations. Plastics have become almost indispensable to the modern designer, and we will see an increasing use of materials that can be easily molded and offer a means of adding color and beauty to a product at relatively low cost.

These items and considerations

Internal Trouble

may some day become "tremendous trifles" of the machine-tool industry. Thus the manufacturer who is awake to the desires and needs of the user will have a decided advantage over his less-alert competitor, who some day will become aware that he must not only sell a machine in close competition, but that he also has taken on a job of "selling" its undesirable design features to a customer who already knows what he wants.

Part 2 of Dr. Truedsson's series on machine tool design will follow in an early number.

OUR SHOP . . . 9 — *Mass Production*

TEACH! DON'T BOSS
SPIT
TOOLS ETC.
J. HESS ALLISON INDIANAPOLIS IND.
J.C.P. KOKOMO INDIANA
Would you like a job in Our Shop? Why not send in your picture? EDITOR
JIM C. COLUMBUS IND.
FEBRUARY '46

TIPS for Top Shop Men

119 Back up what your subordinates say and do. Don't let anybody get a concession from you that you've told your aides not to grant. Sure, it gives your sense of importance a fillip. But it makes the man you over-rode despise you, and the man or woman who got the concession secretly disgusted—while he or she makes a mental note that you're an easy mark worth working again.

120 Frequently, the basic idea or general plan of a job is explained only to key men. Make sure all workers get it—either by telling them yourself or seeing that key men pass "the dope" down. And remember the new man here, too—he may be the only man in the department working "blind," because he came in after explanations were made to the others.

121 Remember that many of your new "hands" have never worked in a shop before. Everything is strange and new—including you and your ideas. You will frequently have to start an explanation at the beginning—where you would for the kids at home.

ROUND TABLE

Are "Trade Secrets" Worth Keeping

"According to a book I've been reading, Ed, that 75-mm. French gun you liked in World War I was developed because the French heard the Germans had one. After they sweat through to a cracker-jack gun, they found the report was false!"

"That was a sweet gun, Al—a lot better than anything we or the Germans had up until a few years ago. They sure kept the recoil mechanism a secret too. If you didn't know how to do it, it would blow apart in your face when you tried to take it down."

"I'll bet the spies were busy trying to find out how that one worked! Reminds me of the tricks of our trade that we try so hard to keep secret until somebody works out better ones. It always seemed silly to me."

"You mean it's silly to get a patent or to keep a new idea to yourself?"

"No, Ed, of course not. To begin with, a patent doesn't keep a secret—it just prevents other fellows from using your idea for a while. And a secret formula is different, too—you can base a whole business on one. But what I'm thinking about is shop kinks. Some guys guard 'em like they were jewels."

"Why not? After all, a company's profit might depend on the tricks it has for making something. Why let competitors know how to watch what you're doing?"

"Well, I've always believed, Ed, that passing around such ideas helps everybody. If I show people what I'm doing, and they show me, we're both better off."

"What if they don't show you, though, Al? They can just pick your brains and not return the favor."

"Not for long. Turn and turn about is fair play. It's easy enough to spot a chiseler like that. Besides, let 'em see what I'm doing! If I can't stay ahead of them when they're copying me, I can't stay ahead when they're not. I figure that by the time they've copied me, I'll be doing the job that much better—and they may work out a wrinkle in copying."

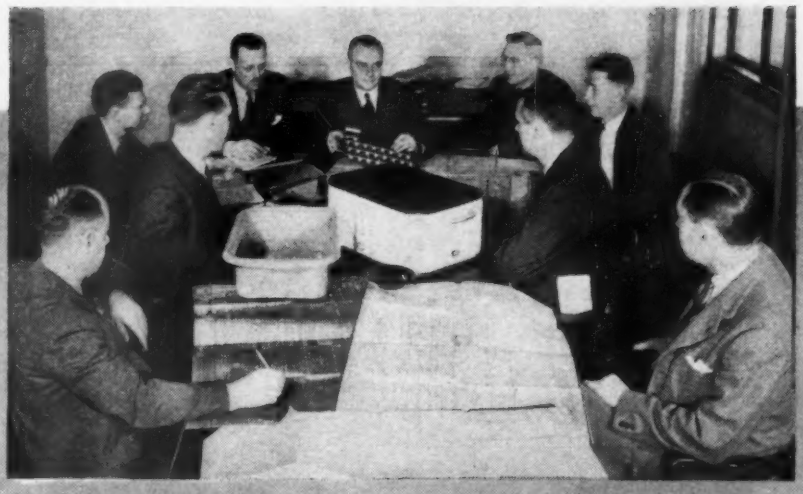
"What good does it do you to work out an idea, Al, if somebody copies it? Seems to me your advantage disappears then."

"No, Ed, it doesn't. I still get the credit for the idea—and if I work out ideas often enough, good enough for others to copy, I get a reputation for originality that nobody can match."

"Now you're a publicity hound, Al. I'd rather play my cards closer to my chest and let the other guy play his own game too. What good does publicity do?"

"It builds a reputation for originality that's worth real dough, both here and outside. After all, we work on a basis of supply and demand too. Stands to reason, the Boss will pay me more if he thinks somebody else is willing to."

SHOULD SHOP KINKS be kept secret, or announced? Do publicity and reputation gained by telling of them compensate for possible loss of commercial advantage? Your ideas and experiences will be of interest to other readers. Discussions of earlier topics appear on later pages.



Manufacturing and production verification committees are responsible for getting each new product ready for production lines

Committees Ease New Products Headaches

BY R. F. BISBEE

MANAGER OF QUALITY CONTROL, MANSFIELD WORKS, WESTINGHOUSE ELECTRIC CORPORATION

Manufacturing and verification groups coordinate activities of various departments to get production started on new items, save money and avoid delays

THE ELECTRIC Appliance Division of Westinghouse has eased many headaches usually associated with starting a new product into production by the correlated work of two committees—a manufacturing committee and a verification committee. The resulting new-products development system has created many benefits. It has decreased the amount of product development necessary on the production line itself, has increased output and has lowered manufacturing costs. It also makes for a higher-quality product and for a better understanding among all interested parties at the start of actual production.

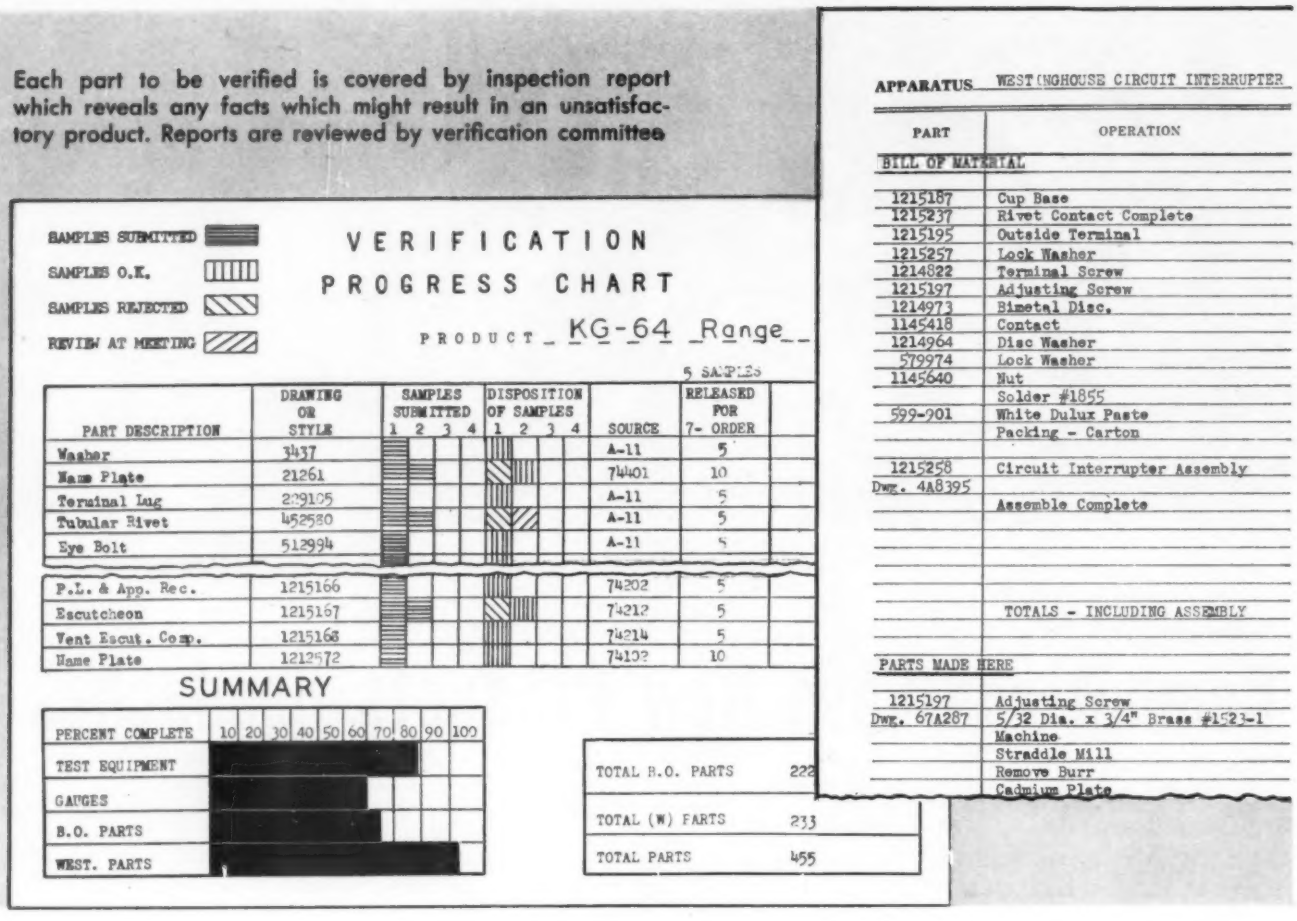
A request from the sales department to develop a new product or improve an existing one is the initial step in the system. Upon receiving the request the engineering department designs and builds a model on a so-called "product development order," known as a "6-order." When the model is completed and satisfactorily tested, it is turned over to the manufacturing committee which focuses the collective abilities of the entire manufacturing organization on the product. Thus the work of all manufacturing sections is coordinated to start production in the shortest possible time, to get the lowest production cost, to eliminate unnecessary development cost, to improve the quality of the product and to adapt the new product if possible to available equipment.

Manufacturing committee for a given product is comprised of the chief methods engineer, who is permanent chairman, representative of the production planning department, as permanent secretary, section engineer responsible for design of the product, a tool engineer, superintendent of the division in which the product is to be made, representative of the time-study department, division quality-control supervisor, a quality-control gage and test engineer and a cost estimator. In addition, representatives of the sales, production and works engineering departments are called in when desirable. Welding engineers, chief chemist, works metallurgist, packing engineers and others are consulted in specialized jobs. Each interested department thus is made familiar from the start with the problems of other departments.

Meetings of the manufacturing committee give the manufacturing division superintendent a chance to learn about the product and to plan for its production during the development stage. He decides the machine-hours load on present equipment and any new machinery needed, the amount of semi-durable materials required, and any special training for employees.

The tool engineer explains the tooling for parts shown on the drawings and suggests possible changes in product design to lower tool cost without increasing factory cost. He recommends the most desirable manufacturing equipment. After the meeting he lays out the tools and works up a tool estimate for the complete product. One of the tasks of the division quality-control su-

Each part to be verified is covered by inspection report which reveals any facts which might result in an unsatisfactory product. Reports are reviewed by verification committee



SAMPLES SUBMITTED
SAMPLES O.K.
SAMPLES REJECTED
REVIEW AT MEETING

VERIFICATION PROGRESS CHART

PRODUCT KG-64 Range

5 SAMPLES

PART DESCRIPTION	DRAWING OR STYLE	SAMPLES SUBMITTED 1 2 3 4	DISPOSITION OF SAMPLES 1 2 3 4	SOURCE	RELEASED FOR 7- ORDER
Washer	3437			A-11	5
Name Plate	21261			74401	10
Terminal Lug	229105			A-11	5
Tubular Rivet	452580			A-11	5
Eye Bolt	512994			A-11	5
P.L. & App. Rec.	1215166			74202	5
Escutcheon	1215167			74212	5
Vent Escut. Comp.	1215168			74214	5
Name Plate	1212572			74102	10

SUMMARY

PERCENT COMPLETE	10 20 30 40 50 60 70 80 90 100
TEST EQUIPMENT	
GAUGES	
B.O. PARTS	
WEST. PARTS	

TOTAL B.O. PARTS	222
TOTAL (W) PARTS	233
TOTAL PARTS	455

APPARATUS WESTINGHOUSE CIRCUIT INTERRUPTER

PART	OPERATION
BILL OF MATERIAL	
1215187	Cup Base
1215237	Rivet Contact Complete
1215195	Outside Terminal
1215257	Lock Washer
1214822	Terminal Screw
1215197	Adjusting Screw
1214973	Bimetal Disc.
1145418	Contact
1214964	Disc Washer
579974	Lock Washer
1145640	Nut
	Solder #1855
599-901	White Dulux Paste
	Packing - Carton
1215258	Circuit Interrupter Assembly
Dwg. 4A8395	
	Assemble Complete
	TOTALS - INCLUDING ASSEMBLY
PARTS MADE HERE	
1215197	Adjusting Screw
Dwg. 67A287	5/32 Dia. x 3/4" Brass #1523-1
	Machine
	Straddle Mill
	Remove Burr
	Cadmium Plate

COMMITTEE EASE NEW PRODUCTS HEADACHES (continued)

pervisor is to familiarize himself with the standards and to point out where gages and testing equipment are necessary. The cost estimator calls attention to expensive materials, finishes and processes included in the design and submits any cost details needed to make a choice.

When a project is to be submitted to the manufacturing committee for study, the chairman decides who is to be present. At a preliminary meeting the annual and peak production requirements are determined, the date when production should begin, the time when engineering information will be completed, desired factory cost, the tool appropriation and whether the product supersedes an existing model. Part designs and assemblies are studied to get at the best and most economical method of production. A preliminary cost estimate is worked up for the sales department's approval.

After these assignments have been completed, a final meeting of the manufacturing committee is held to decide what parts are to be bought outside, approve engineering drawings, have the methods engineer make a final production study, get the tool engineer to make a final estimate, ask the works engineer and superintendent to estimate cost of new equipment and plant rearrangement, have the quality-control gage engineer and quality-control test engineer determine respectively the gages and testing equipment needed with estimated cost, ask the packing engineer to design a satisfactory method of packing the product and the cost thereof, and get the cost estimator to collect costs from all of the other men involved and make a manufacturing production study summary.

Production Summary Prepared

Made up by the methods engineer, the manufacturing production study gives all the details about the processes, materials and facilities for building the new product in a stated production period. With this study at hand, the cost estimator (1) applies the proper costing rate to all labor estimates and extends them, (2) lists raw and finished materials for each part and calculates the cost, (3) totals the labor and materials costs for each part, (4) prices the complete parts list, using multipliers, and (5) totals the factory cost for the product. The cost estimator then compiles a production study summary for the management.

Work of the manufacturing committee ends with approval by management of the manufacturing production study summary. Thereupon the division superintendent makes the floor layouts, the works engineer orders equipment and installs the layout, and the production department issues a verification or tool development order, known as a "7-order," for making tools and tool-verification samples. Approval of these tools and samples is the responsibility of the verification committee.

This committee checks and proves out materials, parts, operation assemblies, packing and design prior to production. It likewise coordinates the work of all departments. It thereby eliminates much defective materials and parts, because no releases are given until each part is verified. Five samples usually are

MANUFACTURING PRODUCTION STUDY

- AUTO RESET — ESTIMATED PRODUCTION 10,000 PER MONTH — DATE 3-21-44

GROUP	ALLOWED HOURS	L & B RATE	LABOR COST	MAT'L COST	EQUIPMENT	MACHINES REQ'D	CAPITAL COST	SEMI-DURABLE COST	INSTALLATION	FREIGHT	TOOL COST	
1 Req.		B.O.		$.0540	Molds (6 cavity)						$1500.00	
2 Req.	.0242	Standard	.0326	.0134								
2 Req.	.0026	Standard	.0056	.0052								
2 Req.		B.O.		.0020								
2 Req.		B.O.		.0050								
1 Req.	.0122	See Page 1	.0219	.0009								
1 Req.	.1360	See Page 1	.1755	.0199								
2 Req.		B.O.		.0104								
1 Req.	.0012	Standard	.0026	.0003								
1 Req.		B.O.		.0007								
1 Req.		B.O.		.0046								
As Req.				.0010								
As Req.				.0001								
				.0030								
461	.0600	1.29	.0774		Assembly Fixtures	Bench					$2300.00	
					Gages						$1520.00	
					Test Equipment						$1368.00	
					Tool Design						300.00	
			$.3092	$.1165	Total W.D.C. $.4257							
.0005 # at	.18 per lb.			.0009	Tool Kit ASM	1	Available				150.00	
840	.0015	1.91	.0029									
820	.0050	1.77	.0089									
820	.0050	1.77	.0089									
721	.0007	1.75	.0012									

Manufacturing production study gives all details about processes, materials and facilities for building new product in stated production period

made for verification of each part and assembly.

Permanent chairman of the verification committee is the manager of quality control. The quality control organization has the job of checking and approving all materials purchased outside as well as those made in the factory, checking and approving assembly of the product, and conducting proving tests prior to the verification meeting. Permanent secretary is a representative of the production department who follows through on equipment, tools, materials and parts from issuance of the verification order until samples are completed. He coordinates activities so that all delays are avoided.

A verification progress chart is posted in the office of the committee chairman to show daily progress of the project. The chart reveals a description of the part, its style number, a check on samples submitted to the inspection department and disposition of the samples. The quality-control supervisor in the receiving department is given a list of all parts purchased outside to be received on verification orders. Parts as received are checked against engineering data and results recorded on a verification form. Samples and report are then checked by the section engineer who notes his remarks on the form and forwards it to the secretary of the verification committee.

First parts for the new product are checked after being made with the tools built according to designs furnished by the tool engineer. If these parts agree with the engineering information, parts for the verification order are fabricated. There usually are minor discrepancies which cannot be discovered until the verification samples are assembled. Each part which differs from the drawing, therefore, is reported on a special form and is reviewed by the verification committee.

Plan Permits Training

All reports covering outside materials and parts made in the plant go to the quality-control division supervisor in charge of assembly. When all parts have been received, they are assembled in the manufacturing section under regular production conditions. This procedure allows interested parties to become familiar with the assembly and trains them in the various operations.

Each point of assembly is checked and recorded by the division inspector, who includes in his report all remarks from the manufacturing and tool divisions about discrepancies found and suggested improvements made during verification assembly operations. After samples are assembled and checked, they are taken to the quality-analysis laboratory to be subjected to tests paralleling actual use in the field.

When all samples have been completed and checked, and all reports are in, they go to the verification committee for review and the chairman assigns interested individuals to clear up any problems or discrepancies. There may be several meetings of the committee before the product is released for production. The verification committee is made up of representatives of the service, production, sales, packing-engineering, engineering, manufacturing, quality-control, tool and methods-engineering departments.

The system has eliminated many headaches attached to starting production on new products.

TALKING SHOP

Unit Cost

THIRTY years ago, the new maintenance mechanic in a large printing plant was shown a plaguing difficulty with sewing machines. In one morning, with a quarter ounce of his own silver solder, he ended the trouble and salvaged $40 worth of parts. But when his purchase order went to management for an ounce of silver solder, it was turned down. Reason: The plant never bought *anything* that cost a dollar an ounce.

Sunburned Rubber

U. S. RUBBER has equipped its new truck-tire building with "Golden Plate" glass on the north side, "Aqua Blue" opaque glass on the sunny sides. The first type prevents sunburning rubber where tires are stored; the latter keeps out over 35% of the heat rays. Idea here for machine shops with expansion problems.

Canute 1946

CITY FATHERS in East Chicago, Ind., are trying King Canute's unsuccessful stunt of stopping the tide. They have passed an ordinance stopping expansion of local plants; in one case refusing a building permit to a plant with all materials already in hand for a badly needed addition on land within company fences. In another city, a manufacturer who was refused permission to purchase the end of a dead-end street to join his buildings which flanked it on both sides, began preparations to sell out and move. City fathers promptly reversed themselves.

Refreshing

WE STEPPED in on a refresher course recently where G.I. veterans were being tuned up prior to an engineering course. The trend of modern education was quite enlightening. During the tuneup on history the question of a famous engineering project came up. "Who built the Suez canal?" asked the professor. Six feet three of 25-year-old veteran slowly stood up with the answer. "Tyrone Power," he said.

Up to Us

"NO ONE can say what the future may bring about or what may be its demands on us individually or as a nation. But we do know there can be progress, and in ratio to the application made of the knowledge and skills we already have and the efforts that we make to broaden and amplify those skills."—*Alfred P. Sloan, Jr., chairman of the General Motors Board of Directors.*

Objectives

A SPEAKER in Washington recently made the point that our objective not so many years ago was to have two cars in every garage, and that now it is to get two families *out of* every garage. As we recall the published objective was to put a chicken in every pot; now it is to replace the chicken with red meat.

There was something, even further back, about a full dinner pail. That still seems to be a fundamental objective. The pail can be synthetic, but not the contents (meaning that sliced tinned meats are still on the disapproved list). Come to think of it, objectives have changed there too. Dinner is now at night rather than at noon, and the dinner pail is replaced by a company cafeteria tray.

For A Lady

OUR CHICAGO top man facetiously suggested we send him a "finished jewel for a lady" as we departed for a trip through Elgin's Sapphire Div. We did —a pallet jewel (synthetic ruby) for the yoke in a lady's wrist watch. The durn thing is ground to the general shape of a cutting-off toolbit, but is somewhat smaller than a pinhead, so small in fact that recovery is only 36%. (A few are cracked or chipped in processing; the rest just disappear. Too little to find.) Cost finished thus becomes about a buck a copy. Meanwhile we have a 150-carat synthetic-ruby boule to scratch glasses with.

THIS IDEA is infectious and communicable, like measels. Corrado even has us trying it. Here goes:

TIME STUDY MAN—Erudite gent who prefers magazines in the men's room.

BROACHING—Opening a keg for the annual picnic.

DRILL—Practice in burning and chipping tool steel.

CAPE CHISEL—Special type used on Cod and Hatteras.

MAGNETIC HAMMER—Actor with a come-hither personality.

JIG BORER—Tap dancer who thinks you want a fourth encore.

SHAPER—A corset maker.

PLANER—How you wish the boss would speak.

CENTER PUNCH—Halfway between a left and a right hook.

HOOKER—Tall drink for a craneman.

Fictionary

OUR FIRST installment of "Daffynitions" has been reprinted in the "Le Blond News" and we are assured that if it proves popular it will become a monthly feature. We've had only three installments—then News Editor Corrado began thinking so seriously of world problems (or his vacation) that he couldn't even turn up with a wry smile. Maybe the "Le Blond News" can develop some—and then we can reprint those.

Scopes

EDWARD VALVE & MFG. has a trick setup for stelliting valve seats. The valve body is rotated in a furnace while the welder works through a hole in the door. . . . Work at the plant and materials are checked in an elaborate metallurgical laboratory, including some $50,000 worth of imported equipment not duplicated in the United States. More kinds of 'scopes than we can remember.

Profit-Sharing...

HAS ITS POINTS...BUT SUCCEEDS ONLY UNDER MOST FAVORABLE CONDITIONS

BY BURNHAM FINNEY
EDITOR, AMERICAN MACHINIST

The magic name "profit-sharing" sounds foolproof in achieving better employee relations and in securing greater worker efficiency. It has many liabilities, however, as well as assets. The failures thus far outnumber the successes. The pros and cons of profit-sharing are outlined in succeeding pages with examples of individual experiences.

Profit-Sharing Plans Must Have Some Easily Understood Relationship to Company Profits If They Are To Succeed

PROFIT-SHARING has been in the news a lot lately. Many companies adopted it in one form or another during the war. Numerous manufacturers have been investigating its advantages and disadvantages.

The name itself is intriguing. The idea of participating in profits always sounds exciting to people, especially under an industrial system which depends upon profits to keep it sound and stable.

At a time when organized labor is pushing for all it can get, when wage rates have jumped to unbelievably high figures and when industrial relations is management's most important job, it is natural that profit-sharing should come in for keen scrutiny.

Some companies approach consideration of profit-sharing as though it were a completely new development. Yet there is nothing new about profit-sharing as applied to the rank-and-file employees of a company. It has been tried many times over a period of more than 100 years.

At the outset it is fair to point out that profit-sharing can be a snare and a delusion unless used under exactly the right conditions. It has definite limitations. It is not a substitute for good industrial relations. It is not a substitute for payment of adequate wages. It is not a substitute for a good pension program, though it may be contributory to it. And, above everything else, it does not provide insurance against unionization of employees.

Profit-Sharing Defined

Just what constitutes profit-sharing in itself is a matter of judgment. Stock purchase plans usually are excluded, unless an annual bonus includes common or preferred stock of the company or stock is issued to employees as an extra dividend which also is distributed to all stockholders. Even in such cases, some experts frown upon intermingling profit-sharing with a company's own stock.

The award of a bonus to employees does not necessarily qualify as a profit-sharing plan. If it is on a non-recurring basis, say at Christmas, it is not profit-sharing in any recognized sense of the word. It must bear some relationship to company profits if it is to be considered profit-sharing.

Profit-sharing is not something which the management suddenly decides it should share with its employees. Management must announce to all its workers that a profit-sharing scheme is in effect as a permanent part of the company's program. The scheme, whatever it is, then becomes just as much an obligation to be carried out each year as regular payment of wages. It cannot be operated intermittently at the pleasure of the company.

Wage-incentive plans are not to be classified as profit-sharing. Wage incentives are part and parcel of an employee's regular earnings and help make up his weekly pay check. They bear no relationship to the sharing of company profits.

Why Profit-Sharing Is Adopted

Profit-sharing is adopted for a variety of reasons. At times one reason alone is the motivating force. On other occasions a combination of reasons has been the determining factor.

Reductions of absenteeism and of turnover in the working force have been popular reasons for installing profit-sharing plans. This has been especially true when the plans stipulate that the profit per worker is calculated partly on the basis of the number of days worked during the year, and that only workers who have been with the company a specified length of time are qualified to participate.

Profit-sharing also becomes a vehicle to increase production, lower unit costs and get better teamwork from all employees. It promotes employee security, particularly when applied on a deferred or savings basis (a point which will be discussed later in this report).

One motive for profit-sharing which is not much talked about, and probably holds only in a small

> "If employer-employee relations are not satisfactory, adoption of a profit-sharing plan may give rise to more problems than management had to deal with previously."
>
> —NATIONAL INDUSTRIAL CONFERENCE BOARD

minority of cases, is the thwarting of unionization. If management looks mainly to profit-sharing to keep out unions, it is leaning on a slim reed.

Strange as it may seem to some of the class-war protagonists, certain companies have instituted profit-sharing for the sole purpose of giving their employees a real share in earnings. The employees helped create the profits, so why not share those profits with them?

There are serious objections to profit-sharing. Some of these objections may be successfully overcome and be eliminated as a deterrent to the practical working of the plan. For one thing, employees are likely to take for granted the annual payment of a profit-sharing bonus after they have had it once or twice. The first time it is received, they are delighted. The next time it is just as welcome, but the "edge" has been dulled. The third time distribution of the bonus is an expected event. Then if profits shrink or disappear altogether, thus causing complete omission of the bonus, employees often are dissatisfied.

The trouble is that by then employees have in many cases adjusted their standard of living to include the profit-sharing bonus. It is viewed as part of their regular income. Its loss forces a downward readjustment of living expenses, an action distasteful to any family.

Incentive Aspects

Another objection to profit-sharing is that it often proves to be a poor incentive to workers. The average worker in the average manufacturing plant is far removed from having any direct bearing on profits. He realizes that no matter how diligently he may work, he will not affect appreciably the company's profits at the end of the year. There may be a tendency on the part of some workers to disregard the incentive feature because they feel that their extra efforts are offset by other employees who do not work as hard as they do.

Profits shared with employees normally are distributed only once a year. When 12 months elapse between payments, the incentive to employees to do a better job is at least partially washed out. Near payment time, the incentive presumably is strong. At other periods during the year, incentive tends to lag.

If an employee has a right to some of the profits of his company, he also should share the risks. When business is bad or profits are thin, he should be willing to go along with management and not complain when the annual bonus is temporarily suspended. Yet human nature is such that omission of the bonus is not so charitably received. And no serious thought ever is given to the assumption that if a worker shares in profits, he should share in the losses!

Any company contemplating establishment of profit-sharing should ask itself, "Is our plan simple enough to be understood by our employees?" This question is important because many plans are so complex that the average employee cannot follow the mathematics involved. He is likely to become suspicious of anything which he cannot understand, partly because he has no way of checking to see whether the plan works out fairly for him.

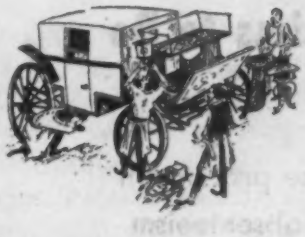
It is doubtful whether most employees can be made to understand the details of distribution of profit-sharing funds, to say nothing of the accounting problems. As long as the profit-sharing procedure is not understood by the rank and file of employees, it is defective as an incentive builder.

One reason why profit-sharing cannot be rated too high as a creator of greater worker incentive is that employees may increase their efforts materially only to find that profits have been wiped out by inventory losses, or by a decline in sell-

What Profit-Sharing Aims to Do

1. Increase production
2. Lower absenteeism
3. Reduce employee turnover
4. Lower unit costs
5. Maintain better supervision
6. Improve quality of work
7. Secure better teamwork
8. Increase employee morale
9. Improve employer-employee relations
10. Further philanthropic aims

History of Profit-Sharing



PROFIT-SHARING has a history which goes back more than a century. It can be traced to farms in England and to French insurance companies in the period from 1820 to 1838. Brewster & Co., a carriage builder in New York, was the first American manufacturer to adopt it. It began a profit-sharing scheme in 1869, which lasted only two years until a strike occurred.

U. S. plans which had staying qualities appeared for the first time in the 1880's. Then the Pillsbury Flour Mills Co., Procter & Gamble, N. O. Nelson Manufacturing Co. of St. Louis and Ballard & Ballard of St. Louis began experimenting with profit-sharing. In the years from 1881 to 1936 inclusive, some 185 companies in this country adopted profit-sharing in some form. The number was far below that in Britain, according to figures presented by C. Canby Balderston in his book, "Profit Sharing for Wage Earners."

A considerable group of American manufacturers took on profit-sharing for the first time in the late thirties. Impetus was given to profit-sharing during the war years when companies were searching for ways and means of stabilizing their labor force and of offering added incentives to employees to do a better job.

Most of the war-born plans were of the deferred type. In fact, those which were of the cash-distribution type were virtually transformed into deferred classification by the rules of government freezing jobs and wages. Federal authorities laid down the policy that cash bonuses could be distributed only under most rigid regulations. The policy was tough enough that it made necessary the temporary postponement of most profit-sharing payments.

ing prices, or by other factors beyond the control of employees.

Payment of piddling amounts to workers as their share of profits will not cause much hat-throwing enthusiasm. The setup must be such that a healthy chunk of money is paid out to each employee. For this reason, companies should not attempt to set up a profit-sharing scheme unless profits are fairly large in relation to the number of employees. The greater the working force participating in profits, the less likelihood that the bonus per employee will be substantial. The chances then of profit-sharing plans being successful are multiplied in small companies compared with large companies.

Twenty years ago Gorton James, in his book "Profit-Sharing and Stock Ownership for Employees," said that the "strength of profit-sharing seems to vary in inverse ratio to the number of employees involved and in direct proportion to the degree of managerial authority which the sharers exercise." This shrewd observation still holds today.

Government statistics reveal that a relatively high percentage of companies make little or no profit. They are struggling constantly to keep out of the red. This fact automatically restricts the number of companies which can afford to adopt any form of profit-sharing. One observer comments that industries with a low labor cost relative to total cost are better suited to profit-sharing than those with a high labor cost. And, to repeat, unless the bonus is of generous size, it is not appreciated.

Unions have not taken too kindly to profit-sharing. Traditionally they have been lukewarm or opposed to it. Their leaders, even back in the days of Samuel Gompers, felt that it often led to wage rates below the recognized union level. They believed that it might interfere with a man's freedom in moving from one job to another, exerting an undue influence upon his decision.

Extra compensation in the form of profit-sharing might easily cause wages in a particular factory to vary from the standard established for an entire industry or for a specific community.

It thus would cause embarrassment to union officials and would compel the formulation of special rules.

There are still other reasons why unions are not enthusiastic about profit-sharing. For one thing, the shared profits normally would be calculated on the basis of accounting procedures which cannot be checked by the employees or their representatives. Managements object to unions having access to their books, hence the chance for checking is denied. Again, union officials are of the opinion that profit-sharing should be classed as deferred compensation which employees would prefer to receive in their regular pay envelopes.

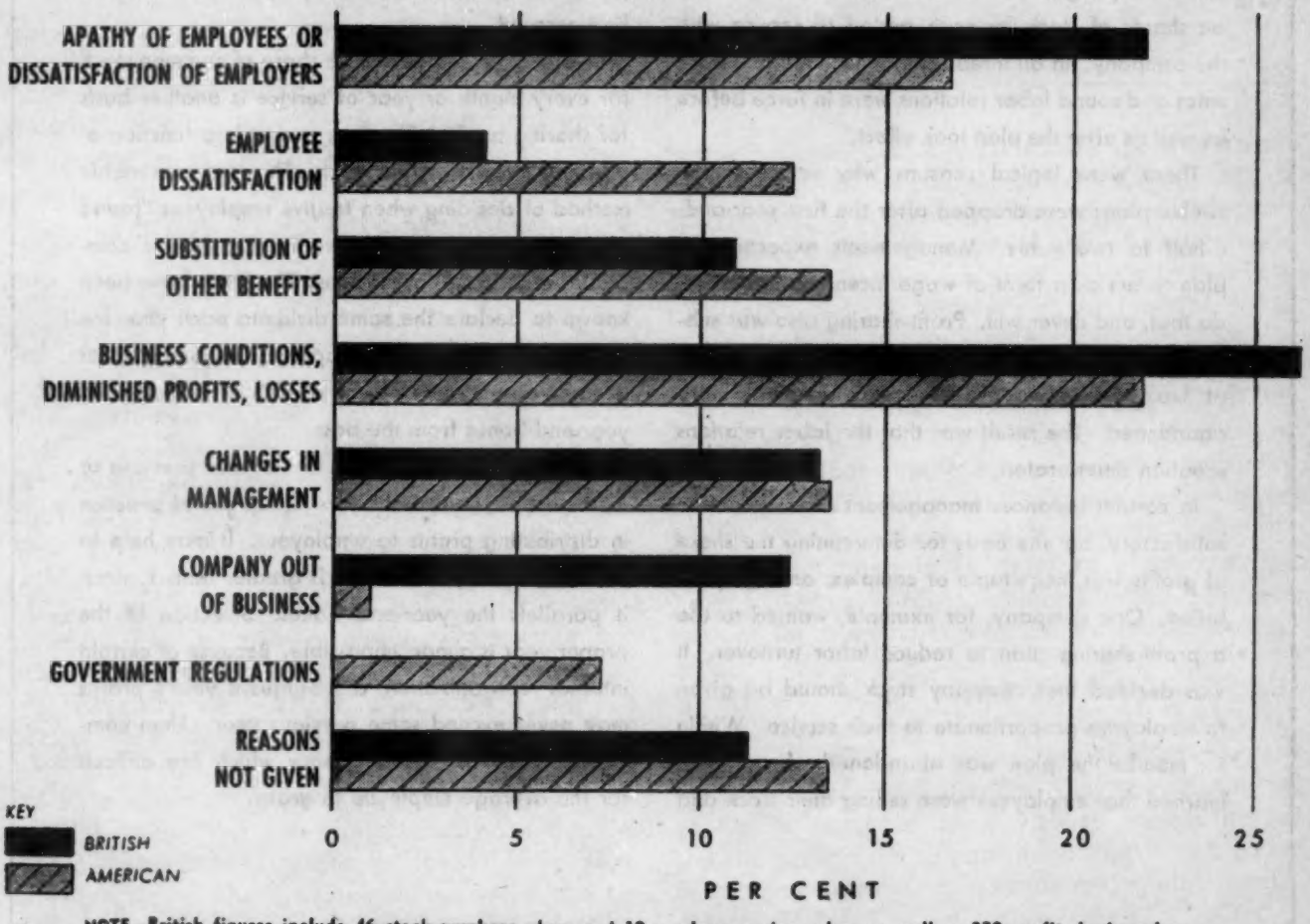
Not mentioned by unions as one of the main objections is that profit-sharing, carried out intelligently and sincerely as part of an enlightened industrial relations program, may be a potent deterrent to unionization. Hence the real source of opposition from some union leaders.

British and American experience with profit-sharing has not been too happy. Profit-sharing plans took a spurt in the 1920's and again in the late 1930's. Perhaps the greatest impetus of all came during the recent war years. At that time many companies established plans of the deferred distribution type. Because of the tax advantages of such plans, manufacturers in the excess-profits tax brackets could give employees a share of profits with little loss in income. Moreover, the profits to employees would not be considered taxable income until made available to them.

Many of these plans were set up, however, before the Bureau of Internal Revenue in 1944 and 1945 made known "the rules of the game," as pointed out by Meyer M. Goldstein, president of the Pension Planning Co. of New York, at a meeting of the American Management Association. These rules, in brief, were:

1. Company directors would not be allowed to

WHY PROFIT-SHARING PLANS HAVE BEEN DISCONTINUED BY 96 AMERICAN AND 397 BRITISH COMPANIES



NOTE—British figures include 46 stock-purchase plans and 19 employee-savings plans as well as 330 profit-sharing plans
SOURCE—National Industrial Conference Board

Survey of 12 Profit-Sharing Plans

SHOWS ONLY 3 SUCCESSFUL

Consolidated Management Consultants, New York City, have completed a survey of profit-sharing plans with which they have worked. Twelve of these plans, representing a cross-section of the survey, have been tabulated with the following results: three were successful, seven unsuccessful, and two doubtful. The plans have been in force an average of three and one-half years.

Chief benefit from the three successful plans was a 42% average decrease in labor turnover. Absenteeism, on the other hand, was practically unaffected. Productivity and quality of work were not noticeably changed. Two of the three plans were installed to control turnover and the third as a philanthropic gesture. All three awarded dividends on shares of stock for each period of service with the company. In all three companies equitable base rates and sound labor relations were in force before as well as after the plan took effect.

There were logical reasons why seven of the twelve plans were dropped after the first year-and-a-half to two years. Managements expected the plan to act as a form of wage incentive. It did not do that, and never will. Profit-sharing also was substituted in some cases for good labor relations. In at least one company, grievance meetings were abandoned. The result was that the labor relations situation deteriorated.

In certain instances management's motives were satisfactory, but the basis for determining the share of profits was inequitable or complex, and the plan failed. One company, for example, wanted to use a profit-sharing plan to reduce labor turnover. It was decided that company stock should be given to employees proportionate to their service. Within six months the plan was abandoned when it was learned that employees were selling their stock and drifting to other jobs as they previously had been.

None of the profit-sharing plans proved to be an incentive. If a company had a wage-incentive plan, that plan did it. If no wage-incentive plan existed, production or quality was not increased by profit-sharing.

Issuance of special non-transferable, non-negotiable employee stock was an unwise move. In most cases the stock could not be redeemed until an employee left the company, hence he resented the fact that it was used as a means of keeping him tied to the company. Some companies, in fact, ruled that if the employee should leave before a designated number of years, he would forfeit his right to participate in the proceeds of the employee-stock which he had accrued.

Award of dividends on one share of common stock for every month or year of service is another basis for sharing profits. The time period is a function of the market price of the stock. This is a reasonable method of deciding when to give employees "found money." It is more effective in the smaller companies than in the larger ones. The latter have been known to declare the same dividend each year for long periods. When that happens, the award loses its force and is looked upon as a fixed present or a year-end bonus from the boss.

Ratios of company profits to the year previous or to any other good base year is not sound practice in distributing profits to employees. It may help to reduce turnover, if the ratio is greater than 1, since it parallels the year-end bonus. Selection of the proper year is almost impossible. Because of certain internal reorganization, a subsequent year's profits may never exceed some previous year. Then complex adjustments are necessary which are difficult for the average employee to grasp.

say how much profit could be given to employees from year to year.

2. Plans could not be terminated at the will of the company.

3. No weighting could be permitted for past service if it favored the higher compensated over the lower.

4. Clear distinction was made between pension and profit-sharing plans.

5. Full disclosure must be made of reasons why profit-sharing trust funds are invested by a company in its own stocks or securities.

6. No discrimination can be made in favor of employee stockholders.

7. Salary classification profit-sharing plans are not necessarily considered discriminatory.

8. Vesting might be required under profit-sharing plans.

9. Early termination of plans is regarded as evidence that they are not bona fide.

10. Contributions by employers to pension plans need not be fixed-level premium payments.

11. Plans requiring contribution of a specified percentage of compensation regardless of profits are not profit-sharing plans.

12. Profit-sharing plans may not be used to meet the cost of pension plans.

13. In the case of a closely held corporation, suit by a disgruntled employee or a union representative growing out of a demand for more accurate accounting of profits, with disclosure of competitive data, may be more than stockholder employees bargained for in establishing the plan.

Pension Plans More Effective

Mr. Goldstein observes that "our experience and research have convinced us that at least 75% (of recently established) profit-sharing plans do not solve employers' postwar problems and should be changed to effective pension plans. This is because profit-sharing plans involve the fact-finding hazard, and further because pension plans are generally more effective than profit-sharing plans in solving employers' problems related to benefits, membership, costs and funding." Mr. Goldstein further points out that it takes a pension plan to provide adequate pensions and that "there is little probability that profit-sharing plans can be as effective as pension plans in taking care of employees who must be retired before age 65."

Profit-sharing has been abandoned by 60% of the 161 true plans surveyed recently by the National Industrial Conference Board. More than one-quarter of the discontinuances were the result of employer or employee dissatisfaction.

Labor's Objections

TO THE UNSUCCESSFUL PROFIT-SHARING PLANS

1. Too complex to understand, calculate or follow.
2. Amount of profit shared too low.
3. Basis for determining "base year" ambiguous.
4. Too long a time (in some cases) to become eligible.
5. Payoff too infrequent.
6. Share did not pay off proportionately to efforts and to base rates.
7. No pro-rata arrangements when discharge or resignation was in mid-year.

Some 36% were dropped because there were no profits to share or the company had gone out of business or had changed hands. Dissatisfaction rose mostly from employees' lack of understanding of the principles involved and their inability to comprehend the influence of the business cycle on profits.

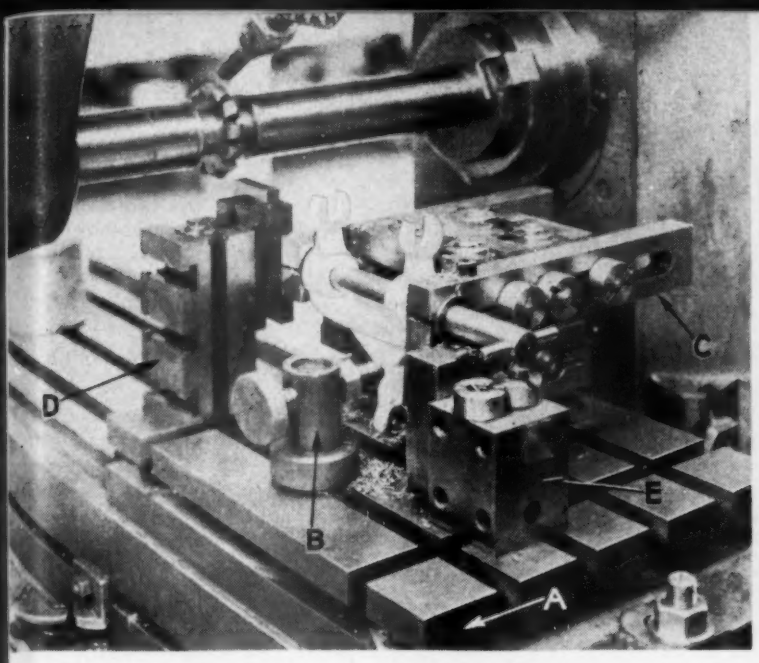
Profit-sharing admittedly is an alluring subject for the reasons heretofore outlined. It has attracted companies for generations and will continue to. But it should not be adopted hurriedly and without checking carefully all the important factors. The setting should be favorable. The attitude of the employer must be right and the labor policy in his plant must be favorable. Soundness of the plan itself will not guarantee its success.

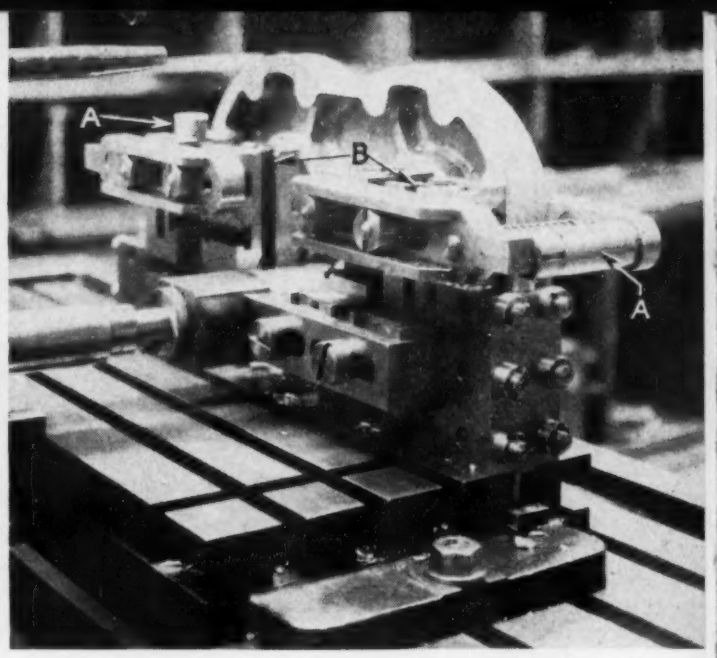
"Standing alone," states Mr. Balderston, "it is a weak device upon which to depend and cannot be recommended except as the culmination of a personnel policy so effective that the sharing of profits is regarded as a further recognition of the mutuality of the enterprise and is not under suspicion as a scheme to evade more fundamental responsibilities."

If You Wish to Set Up a Profit-Sharing Plan

Check This List

- ☐ Are your labor relations excellent?
- ☐ Is your wage scale as high as or higher than that prevailing in your community?
- ☐ Do you have an adequate pension program?
- ☐ Do you have a satisfactory wage incentive system?
- ☐ Are you reasonably sure that you can sustain your profits from year to year?
- ☐ Will each employee's share of profits be enough to make a real impression on him?
- ☐ Have you investigated the merits of immediate cash profit-sharing versus deferred cumulative payments?
- ☐ How frequent do you plan your payments to employees?
- ☐ Is your proposed plan easy for your employees to understand?
- ☐ Have you arranged to tell your employees in advance what you intend to do and to explain exactly how the plan will work?
- ☐ Do you expect to install the plan as part of a long-term program?
- ☐ Are your profits fairly large in relation to the number of employees?
- ☐ Do you have a low labor cost relative to total cost?
- ☐ Does your plan conform to the "rules of the game" set up by the Bureau of Internal Revenue?
- ☐ Would your plan better serve your purpose if converted into a pension plan or be contributory to it?
- ☐ Are employees' shares to be taken from profits before or after deductions for taxes?
- ☐ What safeguards are you taking to make sure that stockholders receive an adequate return on their investment?





Left—One of seven built-up fixtures assembled for operations on a fork lever is used for milling the forks to width. Typical elements used are: *A*—sub-base; *B*—pillar jack, *C*—bushing bar, *D*—stop element and *E*—thrust element. *Right*—Clamps *A* assisted by jacks hold the piece against locating pads and pins fastened to the inner faces of stop elements *B*

NOW...

Jigs and Fixtures From 'Building Blocks'

FROM ENGLAND comes news of a system for the design and assembly of jigs and fixtures in a few hours, using standardized components made to precision limits. Elements like sub-bases, stops, height blocks, gaging blocks, bushing plates, jacks, wedges, tenons, clamps and T-bolts are made in 22 basic designs, and each element is available in several sizes. So instead of the lengthy procedure normally followed in designing and building jigs and fixtures, the user ordinarily employs the "building blocks" in this manner:

1. A skilled tool designer, possibly working in conjunction with shop personnel, assembles lightweight, precision-made plastic duplicates of the elements about a model or prototype part. While this work is going forward, difficulties in production are visualized and the layout is corrected.

2. To assist construction of the layout, a book of reference drawings is consulted, likewise a general parts list. As the sub-assemblies are made, reference letters or numbers are applied to them and the parts noted. In addition an assembly-instruction sheet is written, including a parts list.

3. The layout is photographed from several angles, including a plan view. These photographs, with reference numbers applied to them, are photographed with the assembly instructions and parts list to provide instructions for the shop.

4. The shop assembles the fixture, using the above photostated layout, and can do its part in a few hours. If necessary, all parts of the fixture, except work-locating faces, can be covered with tape to keep out chips.

5. When the jig or fixture has served its purpose, it is dismantled and the elements are returned to stock for re-use.

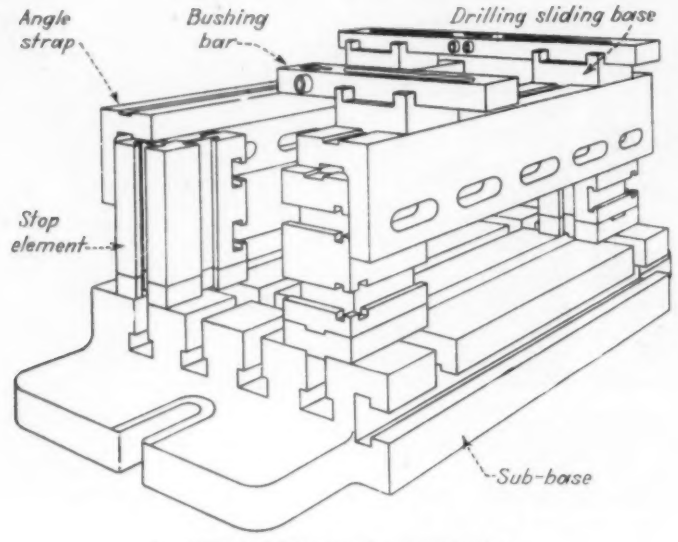
Interchangeability between elements is obtained by using tenons, either integral with the element or fitted separately, locating with tenon slots or T-slots accurately machined for width and centers. The elements are attached to a base, or to one another, by T-bolts held in T-slots cut in the various surfaces of the bases and elements. Provision has been made for expansion of the built-up structure in all directions, to accommodate any part shape. When assembled, the various locations are said to be reliable without resort to extensive gaging. And strength of the structure is said to be sufficient to resist cutting pressures when cemented-carbide cutting tools are used.

Mention has been made of a range of sizes of the various elements. These have been named large, medium and small, and each range of elements take their size from the section of the stop elements (see next page): Large series, 3x3 in.; medium, 2x2 in. and small, 1¼x1½ in. These ranges are considered ample to cover a wide range of components. The various ranges are all interchangeable with one another in any layout.

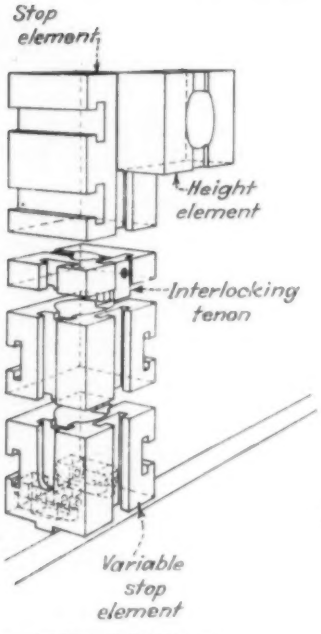
The "Wharton" system, as it is known, is produced by Wharton & Olding, Ltd., 50-52 Tewin Road, Welwin Garden City, Herts, England, under British and foreign patents pending.

● DETAILS OF SEVERAL ELEMENTS ARE SHOWN ON THE FOLLOWING PAGE→

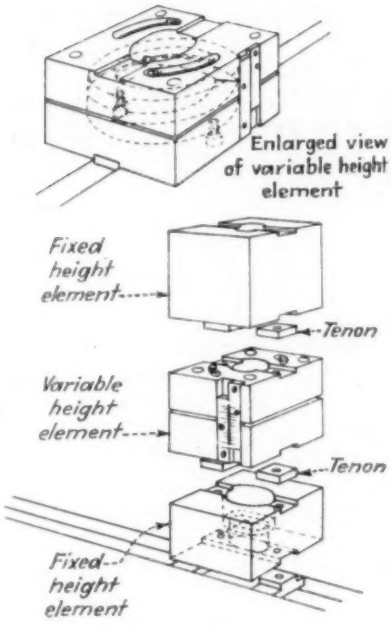
Elements Used for Built-Up Jigs and Fixtures
(CONTINUED)



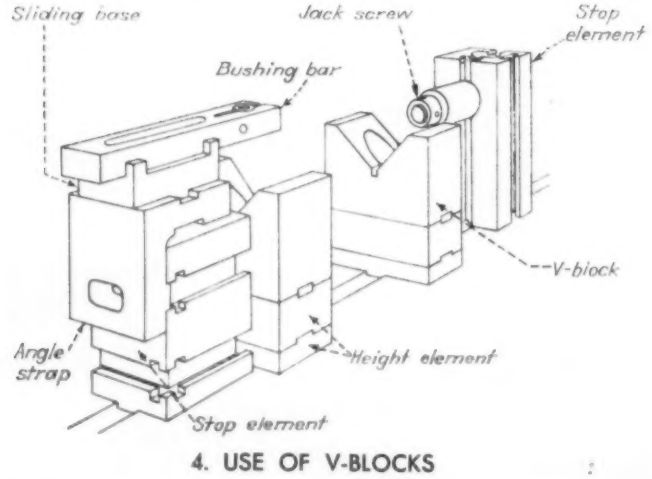
1. ARRANGEMENT OF DRILL JIG



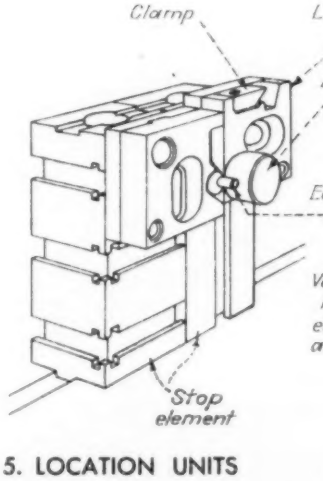
2. STOP ELEMENTS



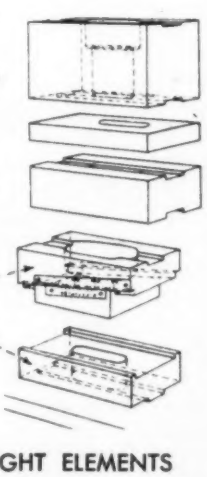
3. HEIGHT ELEMENTS



4. USE OF V-BLOCKS



5. LOCATION UNITS



6. HEIGHT ELEMENTS

Fig. 1—Typical elements of the Wharton system are assembled in a drill jig to show potentialities of built-up construction. The sub-base has four longitudinal T-slots at accurately pitched centers, secondary transverse T-slots at the ends, also T-slots in the edges to provide for extensions and the attachment of additional types of elements. Elements are positively located by tenons and are fastened by T-bolts. Stop elements provide the jig framework to take cutting thrust and locate the angle straps and bushing bars

Fig. 2—Various types of stop elements allow for rearrangement of the disposition of the T-slots. Vertical T-slots are machined centrally on two adjacent faces, one or more horizontal T-slots are cut in the remaining faces at precise distances from the base and each other. Spacing elements, with interlocking tenons, are made in heights of 0.500 to 0.900 in. to allow adjustments of dimensions in 0.100 in. increments. A variable stop element has adjustable tenons to permit lateral adjustment

Fig. 3—Square height elements (shown), and also rectangular and circular height elements, provide definite locating faces as well as setting faces for the cutting tool. Loose tenons fitting into slots in the upper and lower faces of square and rectangular height elements locate them on the sub-base or other element. A variable type has upper and lower sections that can be adjusted relative to each other ± 0.050 in. by cam action. Then, after adjustment, the column of height elements is fastened to sub-base or sides of stop elements

Fig. 4—V-blocks, slotted and recessed for T-bolts and nuts, have base tenon slots for location upon rectangular height elements

Fig. 5—Hole location, even at close center distances, is provided by location units (two shown attached to stop elements). Each location unit is tenoned to a base, which in turn is located on the stop element by a male tenon. Two sizes of dowel-pin holes are provided in the face of the location units; also a V is cut in one edge for an eccentric pin, which is held with a leaf clamp

Fig. 6—Plain rectangular height elements, one with no tenon, are shown in the three upper figures. The variable height element, consists of two details, one slidable on the other.

Well-Planned Tooling Makes SOUND FLASH WELDS

BY C. B. SMITH, WELDING ENGINEER, DOUGLAS AIRCRAFT COMPANY

Welding technique is described for simple tubing, end fittings, and as-forged sections using standard clamping dies, mandrels and tables. While the parts shown are aircraft assemblies they have counterparts in other products from many industries.

A FLASH-WELDING MACHINE is a resistance welding machine designed to produce a butt joint. All portions of the welding cycle are adjustable, and on automatic equipment the same cycle is repeated in a nearly identical manner. The space between the movable and stationary platens at the beginning and end of the weld cycle is important in that the difference (less any initial space between the ends of the part) is approximately the amount of material used in producing the weld. Whenever possible, the final die spacing is made as small as possible to aid in preserving the alignment of the parts; it must be large enough, however, to provide clearance for the plastic material pushed up in the formation of the weld.

After the machine is set up, the first operation in flash welding is clamping the pieces to be welded, one to the movable platen and one to the stationary platen, with their ends approximately touching. Provisions are usually incorporated in the machine for easily attaching current-carrying copper alloy dies which serve both to clamp and to introduce the welding current into the parts. In order to hold proper alignment of the parts and also for electrical reasons, it is mandatory that the dies be relatively close fitting.

After the parts are clamped, the current is turned on and the movable platen is started slowly toward the stationary one, bringing the parts into contact, whereupon flashing commences. Since the heating (flash-

Fig. 1—Setup is used for welding simple tubular parts; the dies are copper-base alloy. Inconsistencies in O.D.'s *A* and *B* show up as eccentricity in the weld. Approximately 1/16-in. length tolerance can be absorbed for a length loss of over ½ in., otherwise a 1/32 in. tolerance should be used

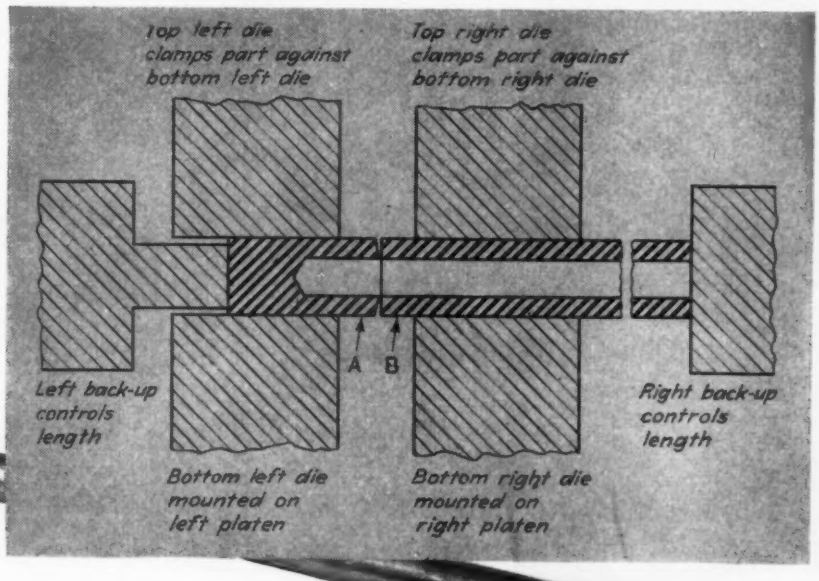

Top left die clamps part against bottom left die
Top right die clamps part against bottom right die
A
B
Left back-up controls length
Right back-up controls length
Bottom left die mounted on left platen
Bottom right die mounted on right platen

Fig. 2—Workpieces suitable for welding in the dies, shown in Fig. 1, are the aircraft control rod (lower) and the engine mount member (upper)

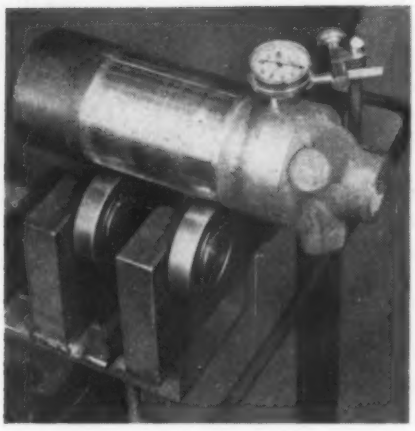


Fig. 3—A welded hydraulic cylinder is checked for eccentricity

ing) portion of the cycle is followed by a forging (upsetting) portion during which the parts are subjected to high axial force, there is a marked tendency for the parts to slip through the dies. In order accurately to control length and to avoid unnecessary die wear, it is considered good practice to "back up" the parts with heavy fixtures, each bolted to its respective platen, utilizing keyways and T-slots provided for the purpose.

A section through a tubular part, the clamping dies and the back-ups, perpendicular to the platens of the machines, Fig. 1, gives the setup used to weld the least complicated of parts, the same shape in clamping and welding areas, such as shown in Fig. 2. A hydraulic cylinder, Fig. 3, also welded on the setup of Fig. 1, is checked for concentricity and alignment with the aid of a dial indicator. Before welding production parts, test coupons representing the parts are usually welded and checked. The test specimens for a part consisting of a fitting welded to a tube may generally be two pieces of standard tubing.

Piston Welded to Tube

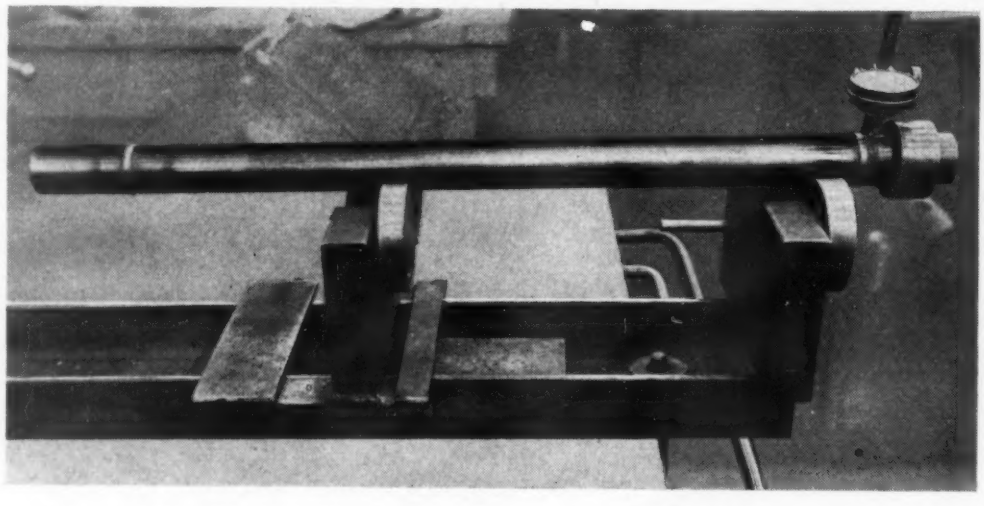
In the hydraulic piston, Fig. 4, there is insufficient material for adequately gripping the piston head on the tube section so that it will be held in precise alignment. If this condition were corrected by adding a longer tube section to the piston head, it would not only increase the cost by the additional machining required and stock wasted, but would also require precise die alignment on the welding machine, because any angularity in the weld would result in a thin spot in the piston rod wall. On the other hand, the piston head may be gripped, Fig. 5, around the large diameter. This permits the weld to be placed relatively near the face of the piston head, where the adverse effect of the angularity is minimized.

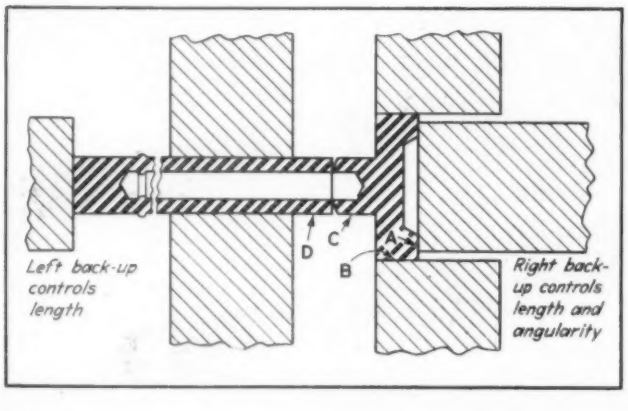
Shaft on Both Sides

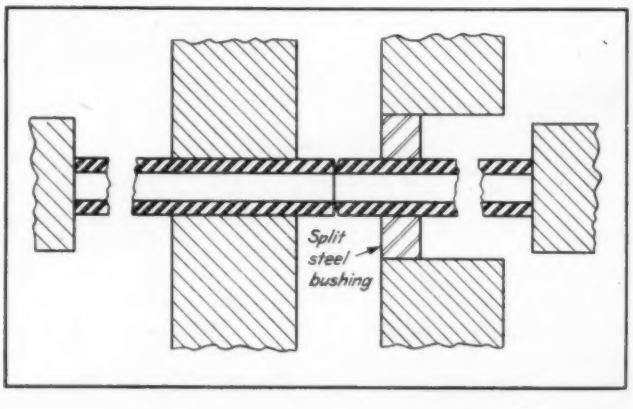
A proper back-up fixture will aid in controlling the angularity to close limits. To produce this weld, the initial platen spacing of the machine should be adjusted so that approximately the same amount of tube protrudes from the clamping dies as is provided on the piston head. The method of using test pieces for the piston, Fig. 6, uses regular tubing with the aid of a split steel bushing. While this test is not a particularly good one for die alignment, it serves to check the general machine setup and weld quality.

A hydraulic piston head for functional reasons has a shaft projecting from both sides. Because the diameter of the piston head was too large to grip in the manner previously described, a modification of that method was utilized. In the first case, Fig. 7, the piston head lies between

Fig. 4 (Right)—The short end of this hydraulic piston makes it difficult to hold concentricity. Fig. 5 (Below)—Dies which flash-weld the piston head to the shaft are of copper-base alloy. Face *A* must be machined square with the shaft centerline to prevent angularity in the weld. Diameters *B* and *C* must be concentric. Also any inconsistencies in *C* and *D* become eccentricity in the weld. Approximately 1/16-in. length tolerance can be absorbed. Fig. 6—Two pieces of stock tubing are selected for testing the piston head welding dies of Fig. 5







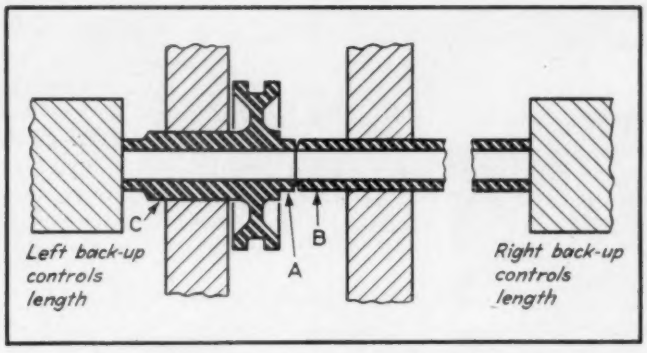


Fig. 7—Copper-base alloy dies aid in flashwelding a piston to a tube. Concentricity must be held at diameters *A*, *B*, and *C*. Approximately 1/32 in. length tolerance can be absorbed in the weld

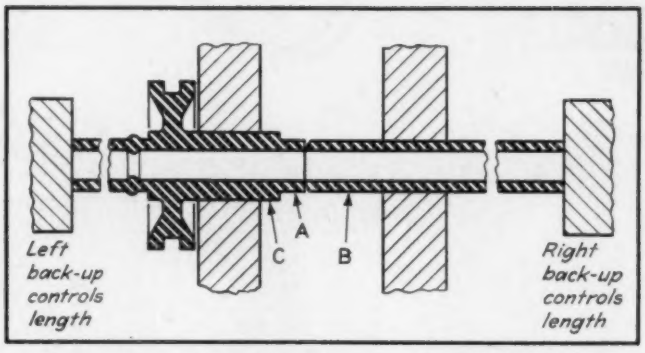


Fig. 8—The welded piston is reversed in the dies to complete the second weld. Here diameters *A*, *B* and *C* must be concentric if the welded sections are to align with each other to make an acceptable joint

the platens of the machine and is backed up by the inner faces of the dies. Platen spacing must be made large enough to clear the piston head as well as the weld. For the second weld, Fig. 8, the part is reversed, placing the piston head outside the platens. Careful straightening and the heavier section provided between the weld and piston face made it possible to avoid thin spots in the piston rod in this area, caused by angularity in the weld.

Parts Proof Tested

A landing gear latch cam assembly, Fig. 9, is proof tested by applying a torsion load. Vital flashwelded parts of an airplane are usually subjected to some sort of proof test to weed out the infrequent bad welds. This test usually bears no relation to the actual way the part is used, but is rather designed to be the most severe test possible to apply to the weld without damage to the part.

An extra wide platen spacing adjustment is used for the first weld of this part, Fig. 10, and the rough, irregular shape of the cam forging is placed in "free air" between the movable and stationary platens. Gripping for current input is on the extreme end, and alignment is aided by a special back-up fixture. Auxiliary tooling in the form of a block and pin was needed to control rotation for the second weld, Fig. 11.

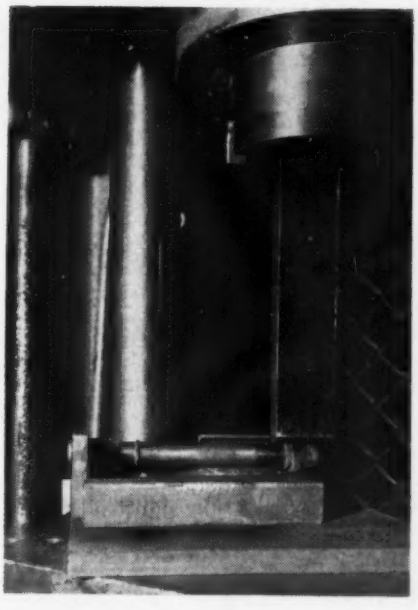


Fig. 9—A hydraulic compression testing machine imparts torsion to proof test a welded landing gear latch cam

In the case of a landing gear crossbeam, Fig. 12, although final machining takes place after welding and heat-treatment, proper rotational alignment must be maintained and the length properly controlled. Extra wide die spacing is used in the setup for the first weld, Fig. 13, and current is introduced around the extreme end of the small forging so that a block controlling angularity may be attached to the inner face of the lower right-hand die. Only minor adapters had to be changed to convert the tooling from right to left hand for the second weld, Fig. 14, the same general welding setup being used for both.

Welding Before Machining

All the parts previously discussed were machined enough prior to welding to establish a good index point for holding alignment and introducing current. With proper conditions, it is entirely feasible to weld two raw forgings together. An illustration of this is the welded engine-mount half ring, consisting of two

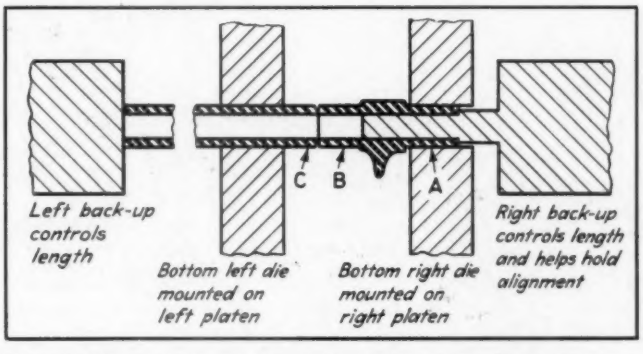

C
B
A
Left back-up controls length
Bottom left die mounted on left platen
Bottom right die mounted on right platen
Right back-up controls length and helps hold alignment

Fig. 10—The first weld on the latch cam, Fig. 9, is made in these dies. Diameters *A*, *B* and *C* must be consistent to avoid eccentricity in the weld

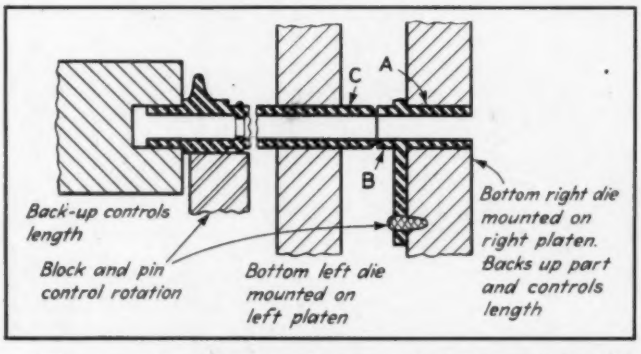
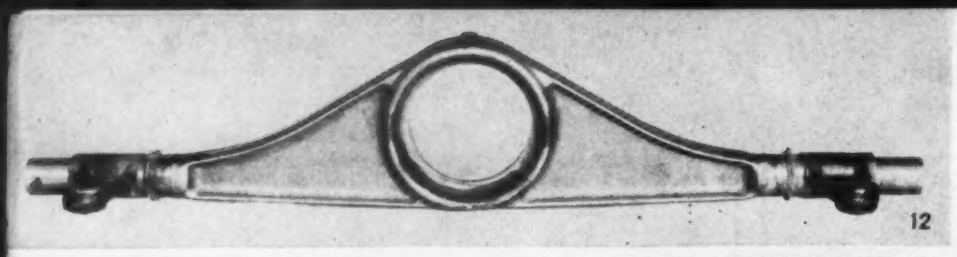

C
A
B
Back-up controls length
Block and pin control rotation
Bottom left die mounted on left platen
Bottom right die mounted on right platen. Backs up part and controls length

Fig. 11—The setup for the second weld on the latch cam provides means to control location. *A*, *B* and *C* are the critical diameters



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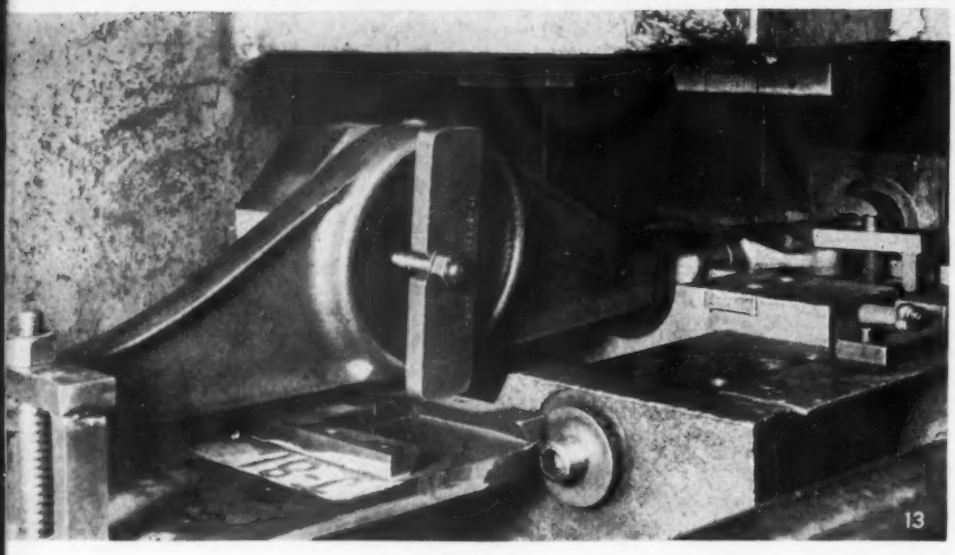

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Fig. 12—A landing gear crossbeam is welded before heat-treating and machining. Fig. 13—The setup for the first weld in the crossbeam controls angular alignment. Fig. 14—The left-hand set of dies is cut out for clearance in clamping the crossbeam for both first and second welds. *A*, *B* and *C* are the diameters to watch

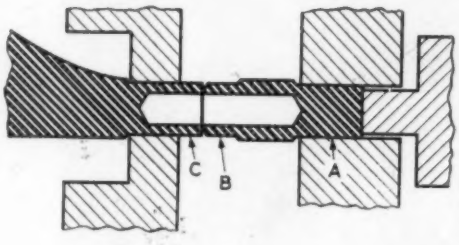
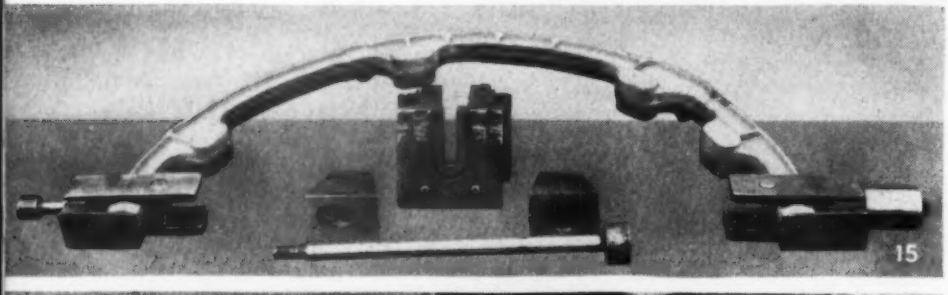


Fig. 15—The engine mount half-ring is made by welding together two quarter-ring forgings. Fig. 16—(below) Clamping dies for welding the half-ring, installed in the machine, shows the recesses for nesting the parts



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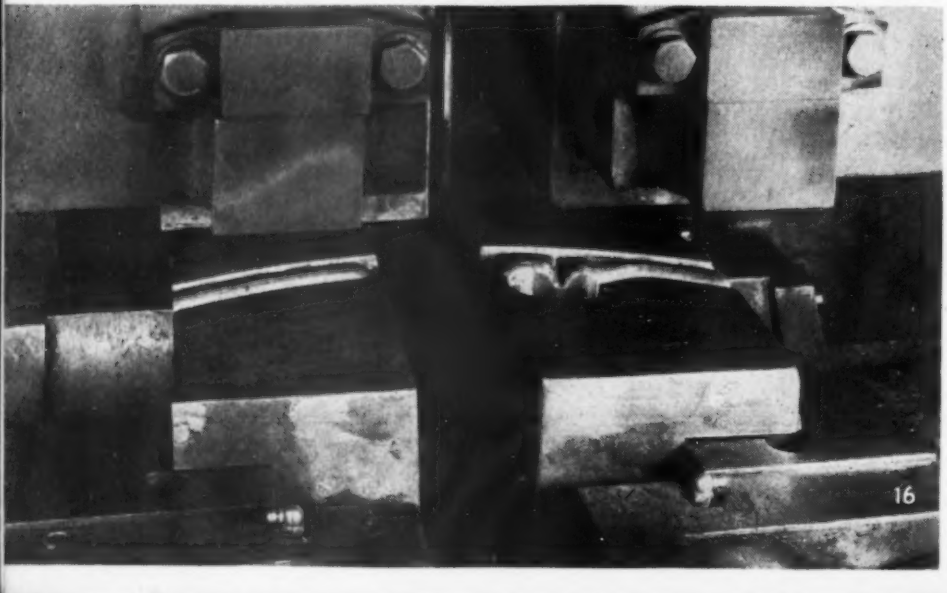

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FLASH WELDING

(Continued)

quarter-ring forgings welded together, Fig. 15. Index points for length and bearing surfaces for the upsetting force are provided by the ribs located near the weld. The parts are nested into the die, Fig. 16, to hold them in their proper alignment. Observe the recesses for the ribs, to which the upsetting force is applied.

Flange Located by Plug

Another assembly, Fig. 17, has a sheet formed to a tube section, and a piece of tubing then welded to this section. The die used for welding this part, Fig. 18, locates the workpiece by a plug, and current is introduced by clamping the plate flat against the inner surfaces of the right-hand dies.

(The concluding installment of this series on flash welding will appear in an early number.)

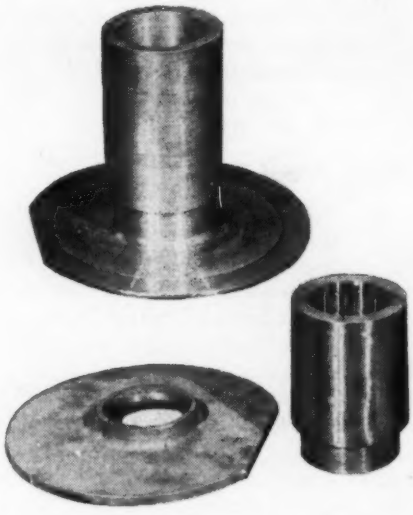


Fig. 17—Sheet metal is welded to a tube section to form the brake torque axle

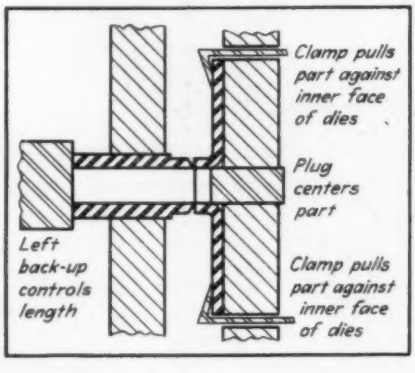
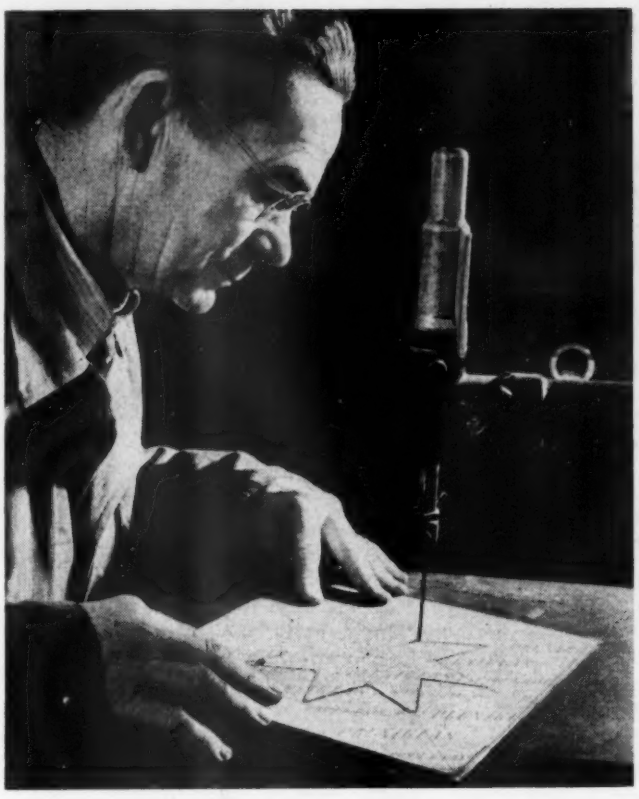
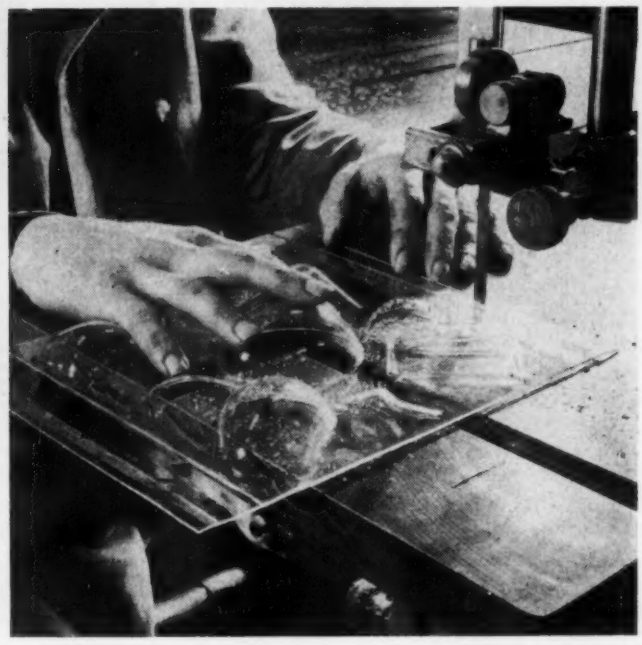

Clamp pulls part against inner face of dies
Plug centers part
Left back-up controls length
Clamp pulls part against inner face of dies

Fig. 18—This welding machine setup is used on the axle assembly of Fig. 17



Power jig saws are used at slow speeds for intricate cutting of transparent plastics



Band saws are suitable for cutting thick sheets and formed shapes

How To Cut Transparent Plastics

BY W. W. FARR

CHIEF TECHNICAL SERVICE REPRESENTATIVE, ROHM & HAAS COMPANY

Special blades and templets and careful selection of speeds, feeds and coolants make possible maximum production and proper finish of plastic parts

TRANSPARENT ACRYLIC PLASTICS may be sawed with the same power equipment used for metal and wood, but special circular, band and jig saws ensure maximum production and finish. Complete transparency, so essential to the function of this material, can be maintained only by close control of sawing technique.

More power is required to cut acrylic plastics than wood and a 10- or 12-in. saw blade will require at least a 3-hp. motor. With generous powering several sheets of plastic can be cut at the same time, provided suitable jigs are used. When high production is desired, multiple sawing will more than offset the increased power costs.

Selection of the proper saw depends upon the type of work to be done. Circular saws should be employed for large pieces. Large diameter blades cut longer between sharpenings and the teeth have more chance to cool during each revolution. Band saws are preferable for cutting thick material as the teeth have greater cooling capacity. A table saw is recommended for cutting large flat sheets if production warrants this additional equipment.

Hollow or concave ground saws provide the necessary side clearance and a minimum of chipping and binding on the thinner acrylic pieces. Blades which are sufficiently hollow ground do not require "set" teeth, give a smoother cut and require a narrower kerf. A spring set is better for slightly thicker material. To obtain a smooth edge, the teeth should be "side dressed" on the machine after they have been set.

The heaviest kinds of cutting should be done with a swaged tooth saw. The tips of the teeth of this saw are widened so that the width of the cut is greater than the body of the blade, giving adequate side clearance. These teeth should be "side dressed" to obtain a good edge cut.

In all cases teeth should be of uniform height and the same distance from the center of the blade. Teeth of uneven length will cause excessive chipping and concentrate cutting strain over a few teeth. Hook or "rake" of teeth should be uniform and in line with the center of the blade.

The blade may be made of special

SAW SELECTION

Thickness, In.	Kerf, In.	Teeth, In.	Special
0.040—0.100	3/32—1/8	5—6	Hollow Ground
0.125—0.375	3/32—1/8	3—4	Hollow Ground
0.438—0.750	1/8	3—4	Spring Set
1.000—4.000	1/8—5/32	3—3-1/2	Swaged

alloy steel, semi-high-speed steel, high-speed steel or tipped with cemented carbide, depending upon the investment the fabricator wishes to make. Life of the blade between sharpenings increases in the order listed. Any of these blades should be properly tempered for the specific operating speed.

Work must be held firmly so the saw moves through the plastic in a straight line parallel with the saw blade. A hold-down prevents chattering, as well as uneven cutting and chipping. A slitter, placed directly behind the saw blade prevents kerf from closing in on the retreating edge. Such closing results in a burned black cut which not only destroys the surface of the cut but also tends to heat and dull the saw.

Plastic pieces may be masked with paper and scribed directly with a pencil. If close tolerances are required, the material should be scribed directly. Layout templets of highly polished plastic, with handles cemented to the opposite surface, may be safely used on acrylics. If metal templets are used the working face should be covered with fine felt.

Saw guides should be adjusted as close to the saw as possible and should control the "weave" of the blade. With a circular saw the blade should be adjusted to a minimum height with relation to the table and thickness of stock.

Vibration should be further controlled by using stiffener washers at the shaft of the circular saw. Smooth edges at the exit end of the piece are obtained by lowering blade speed as the blade leaves the cut.

Selection of the saw blade is the most critical factor in the efficiency of the cutting operation and in the quality of surface. If a good smooth cut is obtained, subsequent polishing will be minimized.

Saws should be run at peripheral speeds of 8-12,000 fpm., depending upon the coarseness of the teeth. Acrylics should be fed at a fairly slow rate to prevent overheating. Moderate smoking and smearing of the pieces will indicate that the feed is too fast. As the teeth begin to dull, the speed should be progressively decreased. As thickness of the piece increases, coarser teeth and an increased feed should be used. Final determination of the best feed will depend upon observation of the operation and the condition of the piece being cut.

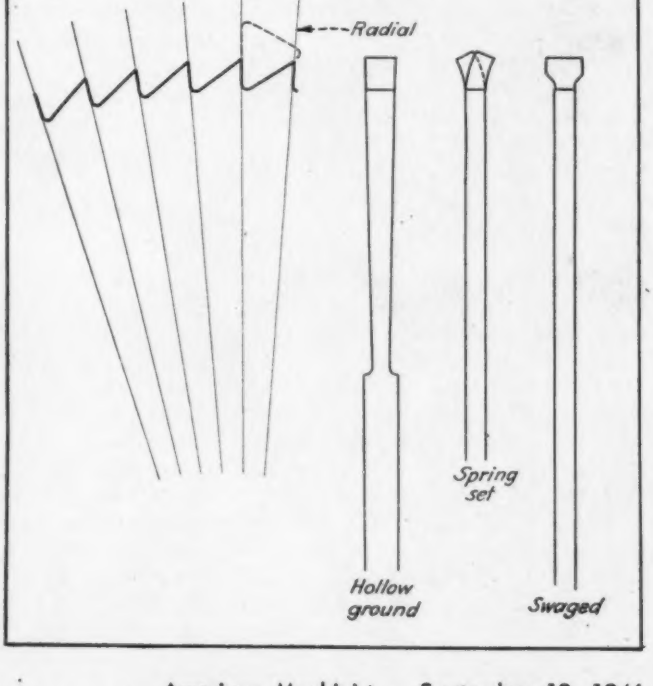
Transparent acrylics, soft and pliable by nature, may be easily worked but once an efficient technique is developed it should be followed closely. Any change in operating technique will be accompanied by heat variations, which readily leave their mark on the material and may affect their location in final assembly.

Saws may be run dry, although some acrylic fabricators report that coolants improve the life of the saw and the quality of cut. The saw should be carefully guarded as saws running at recommended speed will throw cooling liquids violently. A large volume of liquid will cool better than a high velocity jet.

Water-oil coolants should not be used to cut masked sheets unless the masking is to be removed after sawing. The paper absorbs the liquid and reduces the protective qualities. A bar of tallow held against the saw during cutting serves as an efficient lubricant when high production is not required.

Large plastic sheets are more easily handled and squared with table saws, using the same blades as with circular saws

Spring set and swaged saws should be sharpened after setting and swaging



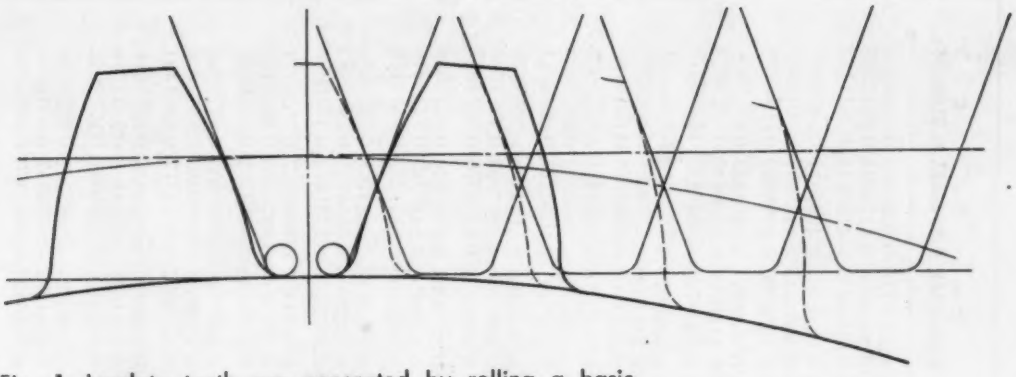


Fig. 1—Involute teeth are generated by rolling a basic rack (or hob tooth) in relation to the gear blank

Hobbed Gear Tooth Layout Simplified...I

BY CLYDE A. YOUNG

A lot of time in gear design may be saved by finding a point common to the centerlines of the generating tooth and the tooth space

MOST GEAR DESIGNERS are familiar with the diagrammatic generation of gear teeth shown in Fig. 1. Although the generating is shown as done by a basic rack, customary practice is to consider this rack as representing the hob.

Notice that the path of the outside line of the generating tool's tooth is always tangent to the root circle of the gear being cut, and that the pitch line of the rack is always tangent to the pitch circle of the blank.

This same drawing-board generation may be accomplished more easily by the method shown in Fig. 2. For this scheme, the involute is drawn first by plotting various points along it and connecting these points by means of a "French" or similar curve. (This is particularly advantageous when the layout is of large scale and thus inconvenient or impossible to "roll out" as in Fig. 1.) The remaining construction is to determine the shape of the fillet. This is done by drawing the tool's tooth in various positions tangent to the involute, and with its outside line (extended) tangent to the root circle.

A glance at Fig. 2 shows that at some instant (position 1 of the figure) the generating tooth's centerline coincides with the gear tooth space centerline, and that in any other position its centerline intersects the tooth space centerline at some point A.

Obviously, if we could calculate the radius to this point A, we could lay out a gear tooth entirely from the generating action of the tool, without calculating various points for the involute, as in Fig. 2, or handling several sheets of paper, as in Fig. 1. In other words, we could draw the tooth curve—both involute and fillet—entirely by generation from the tool's tooth, and with only one sheet of paper.

TABLE I
Values of C for Incre. of α

K	$K\alpha$	sin $K\alpha$	C
1	2°	0.0348995	0.0002034
2	4	0.0697565	0.0008128
3	6	0.1045285	0.0018301
4	8	0.1391731	0.0032564
5	10	0.1736482	0.0050948
6	12	0.2079117	0.0073483
7	14	0.2419219	0.0100206
8	16	0.2756374	0.0131161
9	18	0.3090170	0.0166408
10	20	0.3420201	0.0206005
11	22	0.3746066	0.0250017
12	24	0.4067366	0.0298532
13	26	0.4383712	0.0351629
14	28	0.4694716	0.0409409
15	30	0.5000000	0.0471976
16	32	0.5299193	0.0539443
17	34	0.5591929	0.0611936
18	36	0.5877853	0.0689592
19	38	0.6156615	0.0772561
20	40	0.6427876	0.0861001

This point A is shown, Fig. 3, with the geometry (or should I say involutometry?) of the layout method. Let B be the pitch point (point of tangency of generating rack's pitch line and blank's pitch circle).

As the rack tooth swings through its various positions, this point B on the rack tooth describes the arc BC, and this arc BC is an involute of the blank's pitch circle, because of the relative rolling action between any generating rack and the gear being cut. Then $BD = CD$ from the basic properties of an involute.

For this construction, it is most convenient to assume some increment angle at which to draw the various positions of the tool tooth. Let this angle be called α. Then, if K is the number of times this increment angle is used for any position being considered, $K\alpha = OAE = AOD$ where point O is the center of the blank. Let R = *Pitch Radius* $= OB = OD$ Then $BD = CD = OE = RK\alpha$ where $K\alpha$ is in radians.

$$OA = \frac{OE}{\sin K\alpha} = \frac{RK\alpha}{\sin K\alpha}$$

Rather than measure this radius, OA, it is easier to measure from the pitch point B.

$$BA = OA - R = \frac{RK\alpha}{\sin K\alpha} - R = R\left(\frac{K\alpha}{\sin K\alpha} - 1\right) \quad \ldots\ldots\ldots\ldots (1)$$

Since α and K are entirely a matter of arbitrary numbers chosen for layout purposes, the expression $\frac{K\alpha}{\sin K\alpha} - 1$ may be called a con-

Table II — Relation of RC to Pitch Radius

R	C = 0.0002034	C = 0.0008128	C = 0.0018301	C = 0.0032564	C = 0.0050948	C = 0.0073483	C = 0.0100206
10	0.0020340	0.0081280	0.0183010	0.0325640	0.0509480	0.0734830	0.1002060
11	0.0022374	0.0089408	0.0201311	0.0358204	0.0560428	0.0808313	0.1102266
12	0.0024408	0.0097536	0.0219612	0.0390768	0.0611376	0.0881796	0.1202472
13	0.0026442	0.0105664	0.0237913	0.0423332	0.0662324	0.0955279	0.1302678
14	0.0028476	0.0113792	0.0256214	0.0455896	0.0713272	0.1028762	0.1402884
15	0.0030510	0.0121920	0.0274515	0.0488460	0.0764220	0.1102245	0.1503090
16	0.0032544	0.0130048	0.0292816	0.0521024	0.0815168	0.1175728	0.1603296
17	0.0034578	0.0138176	0.0311117	0.0553588	0.0866116	0.1249211	0.1703502
18	0.0036612	0.0146304	0.0329418	0.0586152	0.0917064	0.1322694	0.1803708
19	0.0038646	0.0154432	0.0347719	0.0618716	0.0968012	0.1396177	0.1903914
20	0.0040680	0.0162560	0.0366020	0.0651280	0.1018960	0.1469660	0.2004120
21	0.0042714	0.0170688	0.0384321	0.0683844	0.1069908	0.1543143	0.2104326
22	0.0044748	0.178816	0.0402622	0.0716408	0.1120856	0.1616626	0.2204532
23	0.0046782	0.0186944	0.0420923	0.0748972	0.1171804	0.1690109	0.2304738
24	0.0048816	0.0195072	0.0439224	0.0781536	0.1222752	0.1763592	0.2404944
25	0.0050850	0.0203200	0.0457525	0.0814100	0.1273700	0.1837075	0.2505150
26	0.0052884	0.0211328	0.0475826	0.0846664	0.1324648	0.1910558	0.2605356
27	0.0054918	0.0219456	0.0494127	0.0879228	0.1375596	0.1984041	0.2705562
28	0.0056952	0.0227584	0.0512428	0.0911792	0.1426544	0.2057524	0.2805768
29	0.0058986	0.0235712	0.0530729	0.0944356	0.1477492	0.2131007	0.2905974
30	0.0061020	0.0243840	0.0549030	0.0976920	0.1528440	0.2204490	0.3006180
31	0.0063054	0.0251968	0.0567331	0.1009484	0.1579388	0.2277973	0.3106386
32	0.0065088	0.0260096	0.0585632	0.1042048	0.1630336	0.2351456	0.3206592
33	0.0067122	0.0268224	0.0603933	0.1074612	0.1681284	0.2424939	0.3306798
34	0.0069156	0.0276352	0.0622234	0.1107176	0.1732232	0.2498422	0.3407004
35	0.0071190	0.0284480	0.0640535	0.1139740	0.1783180	0.2571905	0.3507210
36	0.0073224	0.0292608	0.0658836	0.1172304	0.1834128	0.2645388	0.3607416
37	0.0075258	0.0300736	0.0677137	0.1204868	0.1885076	0.2718871	0.3707622
38	0.0077292	0.0308864	0.0695438	0.1237432	0.1936024	0.2792354	0.3807828
39	0.0079326	0.0316992	0.0713739	0.1269996	0.1986972	0.2865837	0.3908034
40	0.0081360	0.0325120	0.0732040	0.1302560	0.2037920	0.2939320	0.4008240
41	0.0083394	0.6333248	0.0750341	0.1335124	0.2088868	0.3012803	0.4108446
42	0.0085428	0.0341376	0.0768642	0.1367688	0.2139816	0.3086286	0.4208652
43	0.0087462	0.0349504	0.0786943	0.1400252	0.2190764	0.3159769	0.4308858
44	0.0089496	0.0357632	0.0805244	0.1432816	0.2241712	0.3233252	0.4409064
45	0.0091530	0.0365760	0.0823545	0.1465380	0.2292660	0.3306735	0.4509270
46	0.0093564	0.0373888	0.0841846	0.1497944	0.2343608	0.3380218	0.4609476
47	0.0095598	0.0382016	0.0860147	0.1530508	0.2394556	0.3453701	0.4709682
48	0.0097632	0.0390144	0.0878448	0.1563072	0.2445504	0.3527184	0.4809888
49	0.0099666	0.0398272	0.0896749	0.1595636	0.2496452	0.3600667	0.4910094
50	0.0101700	0.0406400	0.0915050	0.1628200	0.2547400	0.3674150	0.5010300
51	0.0103734	0.0414528	0.0933351	0.1660764	0.2598348	0.3747633	0.5110506
52	0.0105768	0.0422656	0.0951652	0.1693328	0.2649296	0.3821116	0.5210712
53	0.0107802	0.0430784	0.0969953	0.1725892	0.2700244	0.3894599	0.5310918
54	0.0109836	0.0438912	0.0988254	0.1758456	0.2751192	0.3968082	0.5411124
55	0.0111870	0.0447040	0.1006555	0.1791020	0.2802140	0.4041565	0.5511330
56	0.0113904	0.0455168	0.1024856	0.1823584	0.2853088	0.4115048	0.5611536
57	0.0115938	0.0463296	0.1043157	0.1856148	0.2904036	0.4188531	0.5711742
58	0.0117972	0.0471424	0.1061457	0.1888712	0.2954984	0.4262014	0.5811948
59	0.0120006	0.0479552	0.1079759	0.1921276	0.3005932	0.4335497	0.5912154
60	0.0122040	0.0487680	0.1098060	0.1953840	0.3056880	0.4408900	0.6013260
61	0.0124074	0.0495808	0.1116361	0.1986404	0.3107828	0.4482463	0.6112566
62	0.0126108	0.0503936	0.1134662	0.2018968	0.3158776	0.4555946	0.6212772
63	0.0128142	0.0512064	0.1152963	0.2051532	0.3209724	0.4629429	0.6312978
64	0.0130176	0.0520192	0.1171264	0.2084096	0.3260672	0.4702912	0.6413184
65	0.0132210	0.0528320	0.1189570	0.2116660	0.3311620	0.4776395	0.6513390
66	0.0134244	0.0536448	0.1207866	0.2149224	0.3362568	0.4849878	0.6613596
67	0.0136278	0.0544576	0.1226167	0.2181788	0.3413516	0.4923361	0.6713802
68	0.0138312	0.0552704	0.1244468	0.2214352	0.3464464	0.4996844	0.6814008
69	0.0140346	0.0560832	0.1262769	0.2246916	0.3515421	0.5070327	0.6914214
70	0.0142380	0.0568960	0.1281070	0.2279480	0.3566360	0.5143810	0.7014420
71	0.0144414	0.0577088	0.1299371	0.2312044	0.3617308	0.5217293	0.7114626
72	0.0146448	0.0585216	0.1317672	0.2344608	0.3668256	0.5290776	0.7214832
73	0.0148482	0.0593344	0.1335973	0.2377172	0.3719204	0.5364259	0.7315038
74	0.0150516	0.0601472	0.1354274	0.2409736	0.3770152	0.5437742	0.7415244
75	0.0152550	0.0609600	0.1372580	0.2442300	0.3821100	0.5511225	0.7515450
76	0.0154584	0.0617728	0.1390876	0.2474864	0.3872048	0.5584708	0.7615656
77	0.0156618	0.0625856	0.1409177	0.2507428	0.3922996	0.5658191	0.7715862
78	0.0158652	0.0633984	0.1427478	0.2539992	0.3973944	0.5731674	0.7816068
79	0.0160686	0.0642112	0.1445779	0.2572556	0.4024892	0.5805157	0.7916274
80	0.0162720	0.0650240	0.1464080	0.2605120	0.4075840	0.5878640	0.8016480
81	0.0164754	0.0658368	0.1482381	0.2637684	0.4126788	0.5952123	0.8116686
82	0.0166788	0.0666496	0.1500682	0.2670248	0.4177736	0.6025606	0.8216892
83	0.0168822	0.0674624	0.1518983	0.2702812	0.4228684	0.6099089	0.8317098
84	0.0170856	0.0682752	0.1537284	0.2735376	0.4279632	0.6172572	0.8417304
85	0.0172890	0.0690880	0.1555590	0.2767940	0.4330580	0.6246055	0.8517510
86	0.0174924	0.0699008	0.1573886	0.2800504	0.4381528	0.6319538	0.8617716
87	0.0176958	0.0707136	0.1592187	0.2833068	0.4432476	0.6393021	0.8717922
88	0.0178992	0.0715264	0.1610488	0.2865632	0.4483424	0.6466504	0.8818128
89	0.0181026	0.0723392	0.1628789	0.2898196	0.4534372	0.6539987	0.8918334
90	0.0183060	0.0731520	0.1647090	0.2930760	0.4585320	0.6613470	0.9018540
91	0.0185094	0.0739648	0.1665391	0.2963324	0.4636268	0.6686953	0.9118746
92	0.0187128	0.0747776	0.1683692	0.2995888	0.4687216	0.6760436	0.9218952
93	0.0189162	0.0755904	0.1701993	0.3028452	0.4738164	0.6833919	0.9319158
94	0.0191196	0.0764032	0.1720294	0.3061016	0.4789112	0.6907402	0.9419364
95	0.0193230	0.0772160	0.1738600	0.3093580	0.4840060	0.6980885	0.9519570
96	0.0195264	0.0780288	0.1756896	0.3126144	0.4891008	0.7054368	0.9619776
97	0.0197298	0.0788416	0.1775197	0.3158708	0.4941956	0.7127851	0.9719982
98	0.0199332	0.0796544	0.1793498	0.3191272	0.4992004	0.7201334	0.9820188
99	0.0201366	0.0804672	0.1811799	0.3223836	0.5043852	0.7274817	0.9920394

stant C, and convenient values of C tabulated.

Then $BA = CR$ ..... (2)

Therefore, to lay out a gear tooth, merely multiply the pitch radius by the constant C and measure the product distance from the pitch point along the tooth-space centerline. Through this new point draw the tool tooth's centerline at the proper angle. Perpendicular to the tool tooth centerline, draw a tangent to the root circle and draw in the tool's tooth for this position. Proceed with other angles, and the gear tooth with its fillet is generated.

In use, it is more convenient to work from the circle whose radius is equal to the root radius plus the tool tip radius, so that the compass can be placed on the tangent line rather than drawing the tip arc tangent to the tangent line. That is, Fig. 4, use line *a* instead of line *b*.

Where the scale of the layout will permit, the larger table gives the dimension BA direct. This is a "straight-line" table, so that it can be used for any multiple value of R. For example, if $R = 6$ for a specific layout, the value of RC for $C = 0.0002034$ is one-tenth that for *60*, or 0.0012204. For $R = 100$, $RC = 10$ times that given for $R = 10$, etc.

Acknowledgment is made to the National Broach & Machine Company, and Glenn Tinkle of the Illinois Tool Works, for their assistance in developing this method.

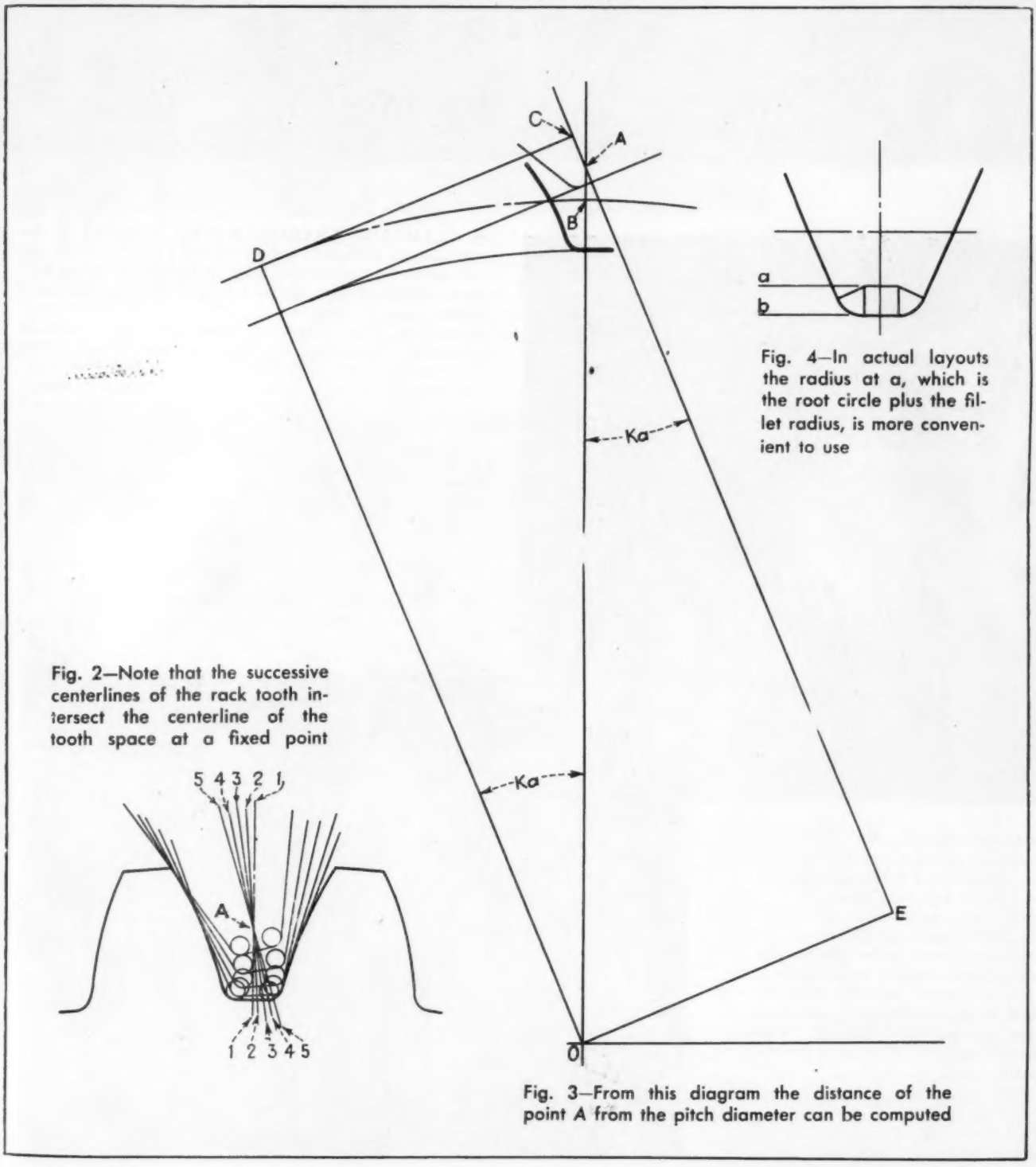


Fig. 3—From this diagram the distance of the point A from the pitch diameter can be computed

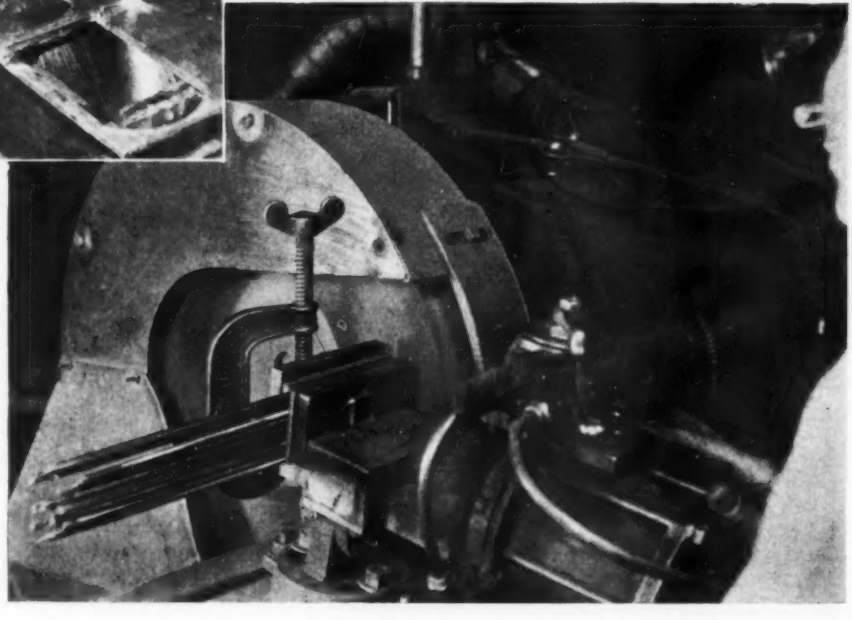
Fig. 4—In actual layouts the radius at a, which is the root circle plus the fillet radius, is more convenient to use

Fig. 2—Note that the successive centerlines of the rack tooth intersect the centerline of the tooth space at a fixed point

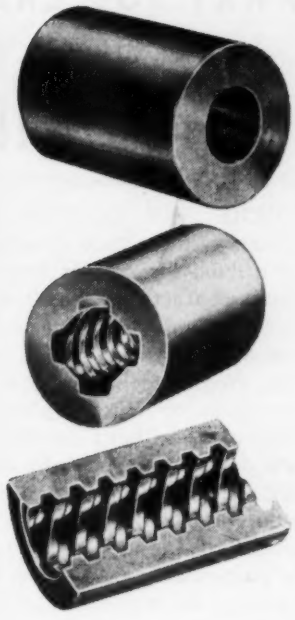
SHOP SHOTS

AUXILIARY LOADING RACKS positioned at the end of each automatic screw machine make it easy for two material handlers to keep 29 automatic screw machines supplied with bar and tube stock. The men also supply forged rings to 12 automatic chucking machines. A 2-ton capacity floor-controlled overhead traveling crane expedites the handlers' work. The racks support the bars and tubes level with the loading position of each of the machines. *Philip C. Booty, Works Manager, West Pullman Works, International Harvester Company.*

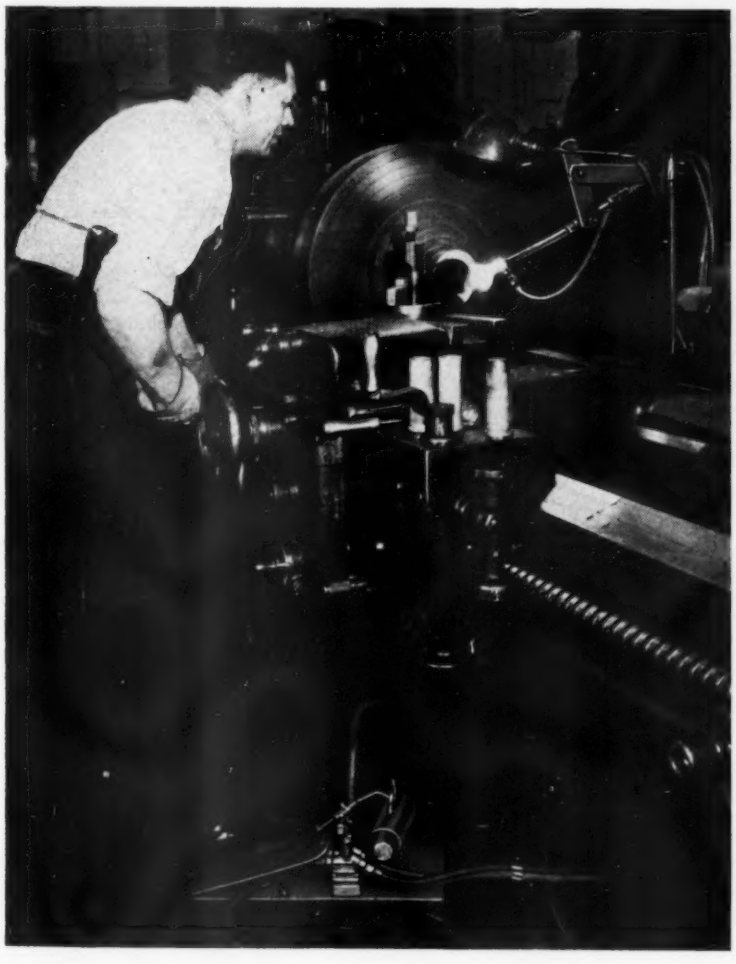
HARDNESS of Stellite welding rods makes them difficult to hold for grinding by conventional serrated steel jaw faces. An air-powered vise with rubber-faced jaws now clamps the load adequately and it only needs to be positioned and the ends aligned against the grinding wheel. The vise is mounted on the swing table of the grinder to facilitate work loading. *Haynes Stellite Company.*

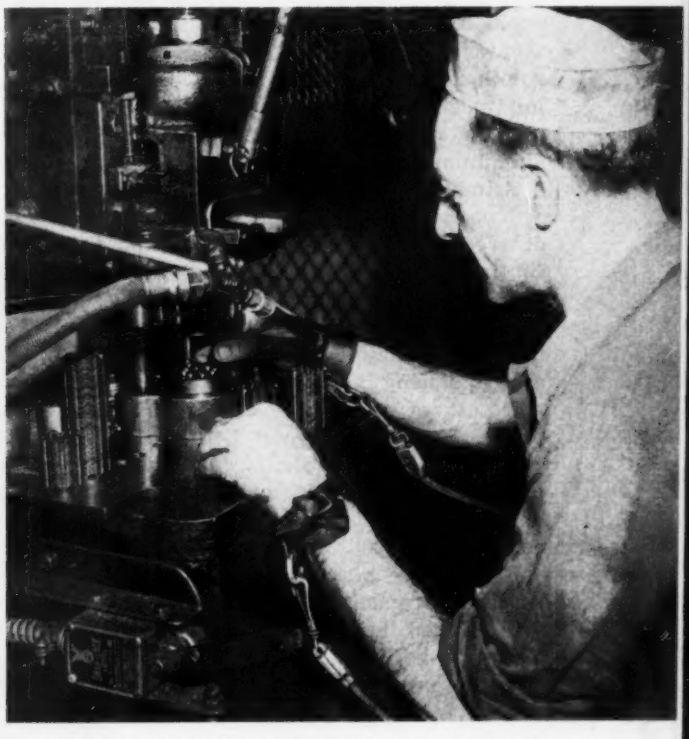


DISTORTION IS PREVENTED during a multiple torch-cutting operation at Service Welding Company by welding and flame cutting at the same time. After the four torches have made their cuts in the outer edge of the ½-in. steel plate the welder follows along making tack welds at the point of entry, thereby restoring the steel to one continuous strip and preventing the possibility of "walking" or "lifting." *Air Reduction Sales Company.*



↑ **PRODUCTION THREADING** of 29 acme bronze nuts has been tripled by tapping the threads in a universal turret lathe instead of chasing with a single-point tool. Threads on both the nut and screw are tapped to three-quarter depth. Notches in the shanks of the taps enable the operator to select the proper tap in the sequence, five being used in all. *Otto Starke, Factory Service Division, Westinghouse Electric Corp.*





↑ **PLANT ACCIDENTS** have been reduced by 22% since punch-press operators, stamping rivet holes in ball and roller bearing cages, have been chained to their machines at SKF Industries, Inc. The shackling device synchronizes movement of the hands with motion of the press. When the press ram descends, cords attached to leather wristbands pull the hands out of danger if the operator fails to act quickly.

← **ANNEALING WORK-HARDENED METAL** during spinning operations has been facilitated by judicious use of a gas torch. No production time is lost as the torch is placed near the work and the flame controlled by a pedal. Only a pilot light burns until the operator steps on the pedal, preventing damage to the work. *East Pittsburgh Works, Westinghouse Electric Corp.*

The Time-Delay Relay

THERE ARE CERTAIN situations which require that a relay respond at a fixed interval of time after the input contact has been made.

For many of these applications mechanical timer relays, with electric clock mechanisms, will do an excellent job. But the electronic timing relay, without moving or wearing parts, gives us split-second timing between the starting and the stopping of a process or between one stage and the next of a sequence. It is particularly useful for highly repetitive short-cycle operations.

The automatic timing of photographic printing is one of its typical applications because of its consistent accuracy and ease of adjustment. Another is the timing of rivet heading machines which permits more uniform results in the fabrication of aluminum aircraft parts.

Grinding, honing and heat-treating are operations in which automatic delayed-action timing aids precision control.

Going back to fundamentals will help understand the operation of a time-delay relay. A capacitor is capable of storing up electric energy, as a result of a voltage across the plates. If we short-circuit a charged capacitor, it will discharge. The bound electrons will escape by the detour provided, and the voltage across the capacitor will disappear.

Now, if we place a high resistor across the capacitor, the same thing will happen, but more slowly. The electrons will leak slowly through the resistor and discharge the capacitor. The rate of discharge is a consistent quantity which is proportional to the product of the resistance times the capacitance. This is the basis for the split-second accuracy of the time-delay electronic relay.

The simplified wiring diagram shows us that the time-delay relay differs from the contact amplifier relay (see previous article) only by the addition of a capacitor across the resistor.

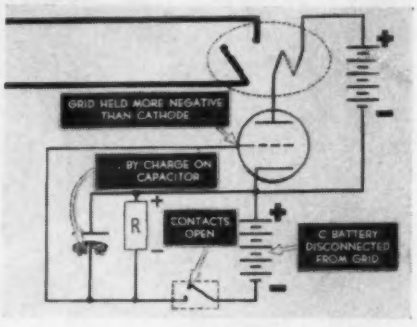
When the contacts are closed, the grid is much more negative than the cathode and the tube passes no current. At the same time, however, the capacitor is charged and stores energy. When the contacts are opened, the C battery voltage is disconnected from the grid. But for a time the grid is held more negative than the cathode by the charge on the capacitor which cannot disappear instantly.

Then after a definite time delay, the capacitor loses enough of its charge so that the grid voltage shrinks, and the tube begins to conduct. This energizes the relay. And, what is important is that it energizes the relay a certain exact interval of time after the contacts were opened. This is required for many industrial applications, for example, the exact timing of the stages in a plastic molding operation.

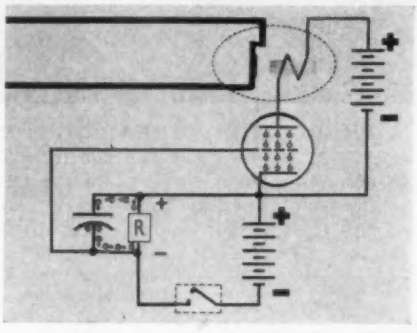
The time-delay relay may be converted to ac. operation in the same way as the contact amplifier relay. Transformer secondaries replace the batteries, a capacitor is placed across the relay coil, and an additional resistor 2R is placed in the control circuit.

The effect of the ac. in the grid circuit requires closer study. When the control switch is closed the grid is always held so much more negative than the cathode, that the tube will not conduct. On the alternate half cycles the grid becomes positive and attracts electrons, and thus the grid capacitor is charged by grid rectification so that an additional negative voltage is built up on the grid side of the capacitor.

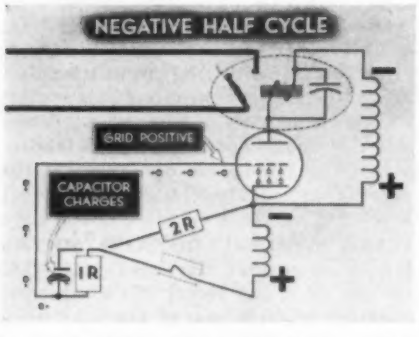
When the contacts of the switch are opened, the grid is held more negative than the cathode by the charge of the capacitor. But, as the capacitor discharges, the grid volt shrinks, approaching the same potential as the cathode. The tube conducts on the positive half cycles, and the relay coil is energized.



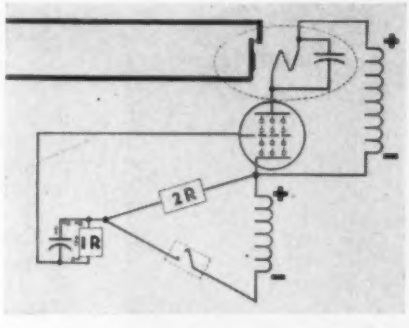
A time-delay relay is obtained by placing a capacitor across the resistor of a contact amplifier relay



Discharge of the capacitor causes a gradual reduction of the grid voltage and a definite time lag between opening the contdcts and energizing the relay



Ac. operation can be applied to the time-delay relay by using transformer secondaries to replace batteries



Opening the switch causes the capacitor to discharge and after a time lag, the relay coil to be energized

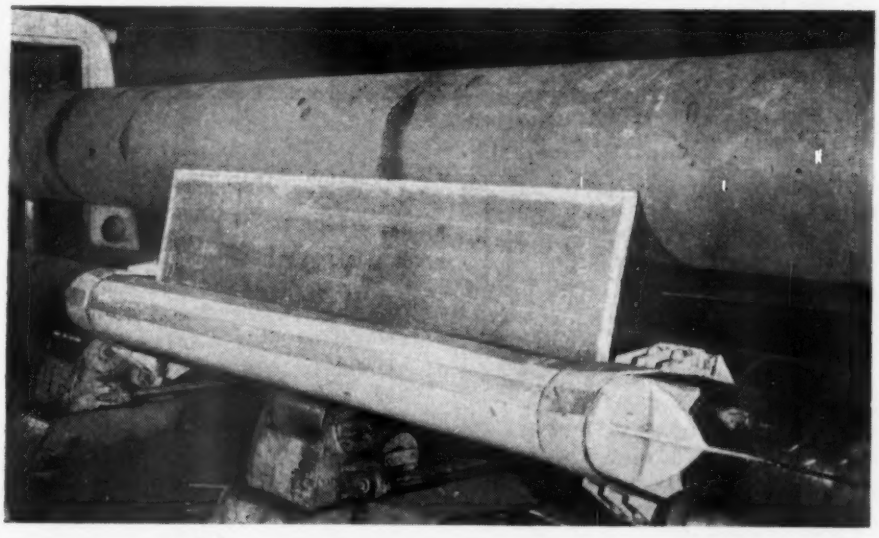
Based on a sound slidefilm in the General Electric industrial electronics course.

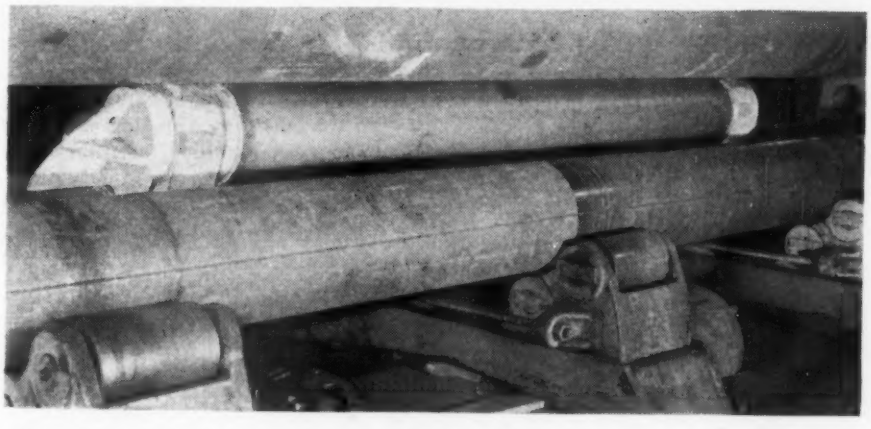
Practical Ideas

Attachment for Plate Roll Makes Heavy U-Bends

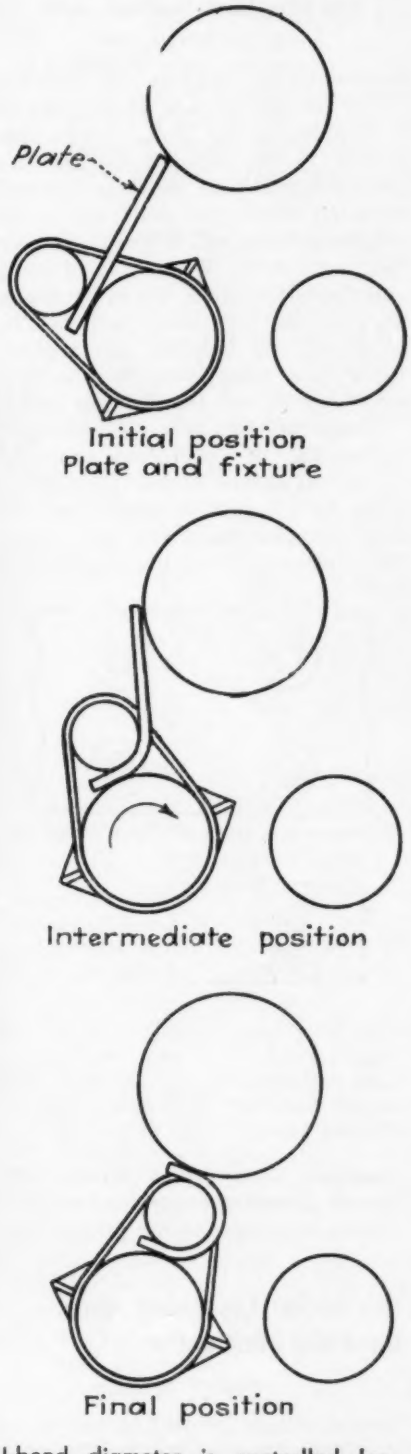
ALBERT AND CHARLES OTT
U. S. Naval Shipyard, Philadelphia

With a keel bending machine, it takes 1 hr. to bend an 8-in. diameter U in ½-in. plate. Now, seven plates can be rolled in the same time. The work encountered ranges from 4 to 11-in. diameter, and the larger the diameter, the more difficult the work becomes on the keel-bender, because instead of a single bend, there are from 7 to 17 individual sharp corners, making the final U out of a series of narrow flats. (These U-plates are used to protect vital pipelines aboard ship from

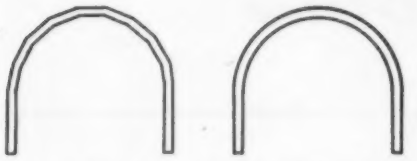




Top: starting position. Plate is placed between the supplementary roll (painted white) and the driving roll which holds the former. Rolling will be clockwise for 90°. Bottom: The white portion of the supplementary roll shows through between the two plate rolls and the finished U-bend appears between the ends of the supplementary roll



U-bend diameter is controlled by the supplementary roll

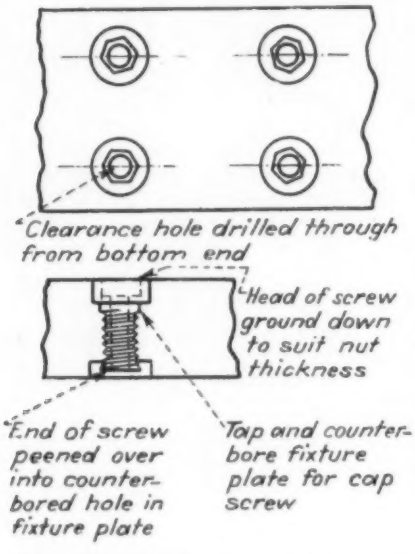


Comparison of product quality as made by keel-bender method, left, and new, faster method, right

fragmentation damage in battle.)

The fixture consists principally of a supplementary roll, firmly attached to the driving roll of the plate-roll machine. Work is inserted between these two rolls when the supplementary roll is in its extreme "out" position. When the driving roll starts to rotate, the plate comes against the top loose roll of the machine and bending commences. Rolling is completed after a total travel of 90° of the driving roll.

The supplementary roll diameter is the I.D. of the U-bend and the loose roll of the plate-roll machine must be adjusted to allow just this diameter plus twice the plate thickness between it and the driving roll.


Clearance hole drilled through from bottom end
Head of screw ground down to suit nut thickness
End of screw peened over into counterbored hole in fixture plate
Tap and counterbore fixture plate for cap screw

Assembly fixture uses socket capscrews instead of expensive broached holes in screw and nut positioning

Hex-Socket Capscrews Make Good Nut Positioners

HERBERT WEITZ

Broached nut holding plates in assembling fixtures can be eliminated by taking advantage of the hardness, precision and low cost of standard socket capscrews. The range of socket sizes is enough to take care of most small machine screw nuts, and the interchangeability of the screws provides a handy way to make fixtures do double duty occasionally.

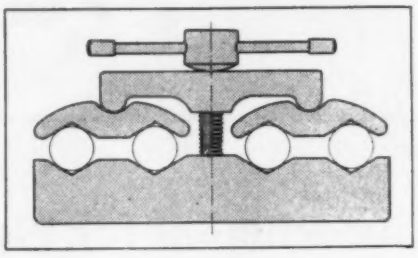
In mounting the capscrews for this work, make the counterbore deep enough to bring the bottom of the hex socket to the desired level relative to the fixture surface. Grind away the projecting part of the screw head, making the socket flush with the surface. If the screw being assembled will project beyond the nut, drill a center hole in the bottom of the socket to clear this screw. In addition to counterboring the top of the fixture, the bottom should be countersunk a little so the ground off screw can be peened over, locking the screw permanently in the fixture. (If interchangeability is desired, protect the screw against vibration with a locknut instead.)

Triple-Yoke Equalizing Clamp to Castellate Four Hex Nuts

MICHAEL AXLER

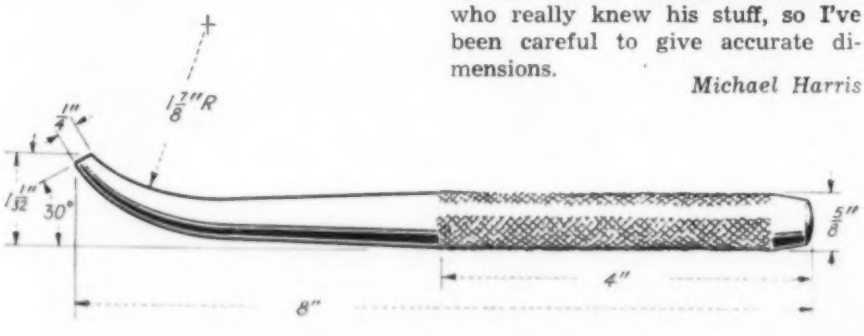
In addition to its primary purpose, this four-station clamp can equally well serve as holder for any kind of round pieces requiring identical finishing. The clamp is quick-acting, and self-equalizing and lends itself well to mounting in various ways.

The base is a rectangular piece of cold-rolled, with four 120° notches cut at right angles across one edge. Extra clearance between the two inner notches is provided for the tapped hole that receives the clamping screw. Two short yokes mate with the two notches in each end of the base, and one long yoke backs up the two short yokes. Because of probable slight inequalities in part dimensons, generous allowance has to be made to assure uniform clamping. Here, all three yokes have plenty of swiveling capacity and there is a spherical washer under the bolt head.



Triple-yoke design permits simultaneous, equalized clamping

With 120° notches, any hex stock is immediately positioned for accurate transverse cuts of any kind, and in work like castellating, the parts can be indexed in 120° steps without guesswork.

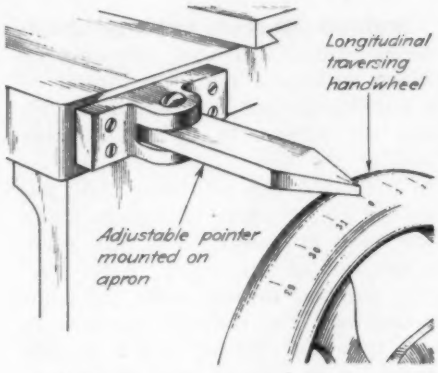


Planing Straightedges — Warping caused a lot of trouble in my first attempts at making a 6-ft. straightedge. I found the best system was to plane the back edge first, then bevel and plane the good edge. If the straightedge was not true, when the clamps were released, I again took a light cut off the back and reclamped to finish true edge.

Conrad Rogers

Oil Grooving Chisel—In addition to its primary duty, this 22-yr.-old tool has cut identifying names and numbers on all sorts of equipment and it's still going strong. A well-worn 16-in. round bastard file was the raw material. The remaining teeth provided a nicely-knurled handle; the business end was finished by an old-time railroad blacksmith who really knew his stuff, so I've been careful to give accurate dimensions.

Michael Harris



Scribed marks on longitudinal handwheel indicate carriage motion

Graduated Handwheel Shows Carriage Travel

MICHAEL HARRIS

On my lathe, I found that one complete turn of the longitudinal feed handwheel moves the carriage one inch. There have been many suggestions for devices to indicate longitudinal carriage motion, but for those whose lathes have the inch per turn-handwheel, here's an easy solution—one which requires very little work.

Because of the easy dividing and the moderate accuracy requirement, I chose fractions rather than decimals. The wheel is first divided in halves, then quarters, eighths, sixteenths and finally thirty-seconds. As each division is just half the preceding, no complicated dividing mechanism is required.

A hinged pointer on the apron gives the reference and it can be swung out of the way when not needed.

This device has proved extremely useful in finishing bolt heads, facing nuts, turning short length to shoulder and counterboring to depth.

Emergency Laboratory Pump Has Many Uses

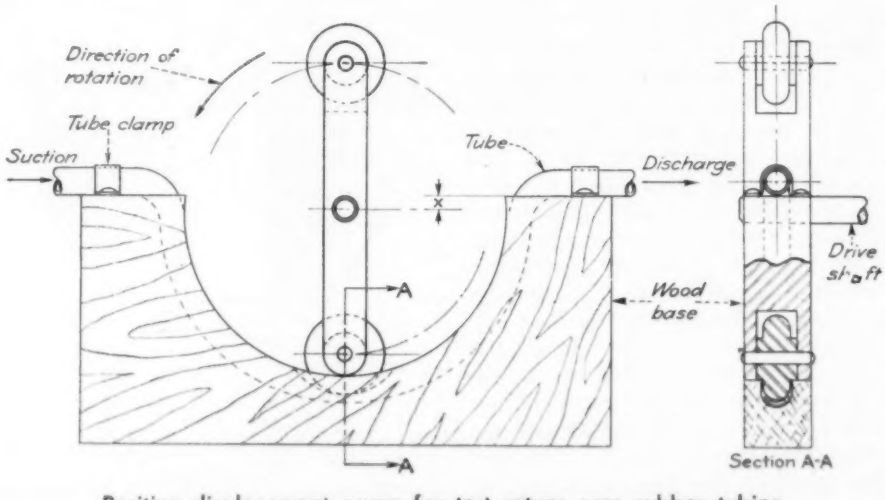
E. J. BREEDING

Rubber hose serves as the cylinder in this pump, constructed in an emergency when small laboratory pumps were unavailable. The tubing is placed in a grooved wooden block and held by two metal clamps. Two rollers mounted on opposite ends of an arm act as pistons, flattening the tube and forcing liquid just ahead of the roller path as the arm rotates.

Note that the center line of pump shaft (dimension "X") is adjusted below top of block so that rotor No. 2 has started its stroke just as rotor No. 1 leaves the tube, maintaining a steady flow of liquid. A slight-unbalance of forces exist at this point which does not harm its practical value as a pump.

No drive is shown, but we mounted pillow blocks on each end of pump shaft and fastened a V-pulley on the end of the shaft.

When tubing becomes worn a new section may be pulled through tube clamps and worn portion discarded. Rubber has many advantages over metal, especially for chemical work. It is unaffected by many liquids which would either corrode metal parts or contaminate the liquid, and neoprene or other synthetic flexible plastic could be selected to pump almost any chemical.



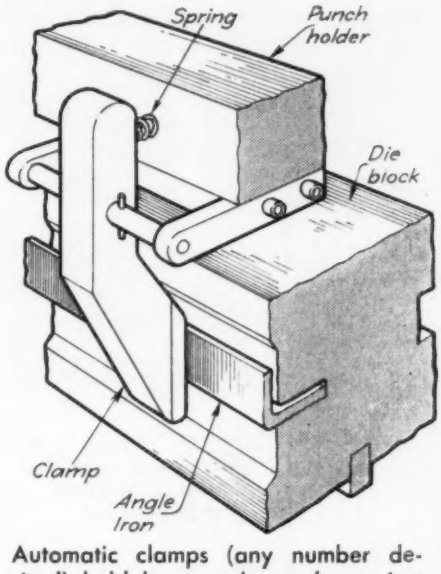
Positive displacement pump for test setups uses rubber tubing

Multiple Clamps Operate From Punch Press Ram

FRANK SUTZ

A recent "Practical Ideas" item described a multiple, full-floating punch system for perforating a long piece of angle iron with 17, ¼-in. holes. Four automatic clamps have replaced three hand-operated toggle-clamps in this setup which has halved the whole operation time, and reduced fatigue considerably.

Each new clamp is fastened to the punch-holder by two arms tied with ¼-in. bolts. On the other end a tool-steel hardened pin through the two



Automatic clamps (any number desired) hold long work evenly against stop by spring pressure

arms acts as pivot for the clamp. A spring, above the pivot pin, is seated in the clamp and in the punch-holder forcing the lower end of the clamp against the die-block.

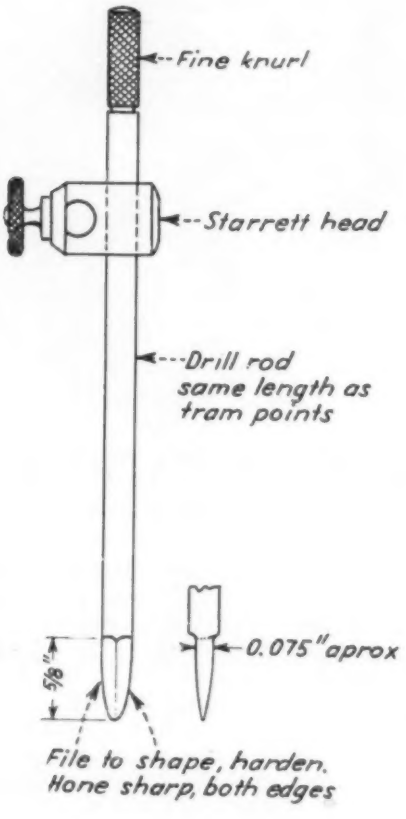
The operator loads an angle into the die-block and holds it in position lightly. The clamps are so designed that at the top of the stroke the clamp is still in contact with the top of the die-block (stripper) thereby eliminating the necessity for a special stop to prevent the clamp from swinging over the top of the die-block. The press ram travels down with the clamp leading the punch by approximately ½ in. so that when the punch contacts the work, the angle is securely clamped.

The shoe on the clamp arm must be tapered enough to let it slip over the angle iron on the down stroke of the press.

Hints on Small Tools

EARL R. GODDARD

Gasket Cutter—For a tram head of the type shown, a gasket cutter was made that worked equally well on paper, asbestos sheet and the various kinds of sheet packings. Of course, the knife point must be smooth and sharp. It has a wide range and it will cut in either direction. When putting it away in the tool box, the knife edges should be protected by shoving a cork over them. The point was hardened by heating until a horseshoe magnet lost attraction for the heated part, and quenching in water, then it was polished and drawn to a very light blue.

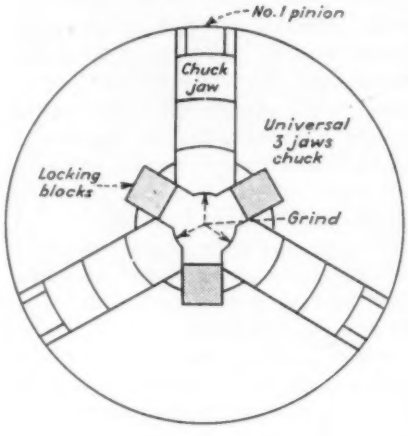


Making Fits With Steel Tape—A steel tape can be used for measuring large inside or outside diameters but it's especially good when measuring a rolled shell that is wavy and out of round. All classes of fits can be made with this method.

When measuring an outside diameter place tape around part with figures *inside* and mark the tape at the point coinciding with end of buckle. Transfer this mark to figure side and you have the circumference provided you have previously checked your tape with a good steel rule. Divide tape reading by pi for diameter. When measuring inside diameter place figures on *outside* or next to wall and proceed as above.

A light coating of grease on parts being measured will assist in holding tape in place. Tape must lie flat against wall and at right angle to axis.

Any allowance on diameter for tightness or looseness should be multiplied by pi and added to or subtracted from *tape reading.* If parts are to be assembled tightly, you would add to male part or subtract from female part. If looseness is wanted, the reverse is true.

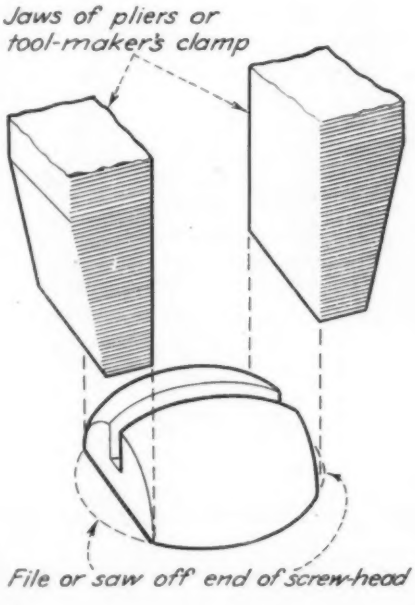


Grinding Universal Chuck Jaws—If you want to true up the jaws on your universal chuck, first decide what diameter work you chuck most. On a small lathe, let us say, it is one inch. With a piece of one inch chucked, measure across the flats of the jaws and select a piece of square stock nearest that dimension. Cut off three short pieces. Place these as shown and tighten firmly. If there is slack in the jaw guides, this will kick the points of each jaw outward just as if you were clamping on a piece of solid stock. Grind jaws in this position making the last two cuts about 0.002 in. each. If the scroll is worn, which it probably is, all diameters chucked will not run true but the work you chuck most should be very close. In chucking work, always tighten on the same pinion every time. This should be the one that was used to prepare the jaws for grinding. Use the same idea for grinding independent chuck jaws.

Multiple Thread Cutting—Sometimes difficulties are encountered when cutting a multiple thread in a nut that do not arise when threading the screw. In some instances setting the compound rest parallel to the lathe bed will help. The gib should be tightened enough to make the rest fit snugly, and all slack taken out of the screw. After cutting the first thread, move the compound rest the required amount to cut the next thread. On a double thread with a ½-in. lead, the movement would be 250 thousandths.

Removing Stuck Screws—If a round-head screw has become rusted or otherwise frozen in place, it probably can be removed in the following way. First, try penetrating oil and concentrated heat with some kind of torch. If this fails, chisel, hacksaw or file away two sides of the head to make two square and parallel walls. Now, "vise-grip" or the equivalent pliers, an adjustable open-end wrench, or a toolmaker's clamp should be able to do the trick, if the rust hasn't penetrated deep enough to freeze the body of the screw.

Broken-off hollow (hex-socket) setscrews can sometimes be removed if it is possible to get a concentrated flame at it enough to draw the temper without damaging the surrounding parts. When this is accomplished, drill through the hex socket and draw the screw with a screw-extractor. *Thomas Trail* (Stuck pipe bushings can be removed with a screw-extractor, too *Oscar Craft.*)

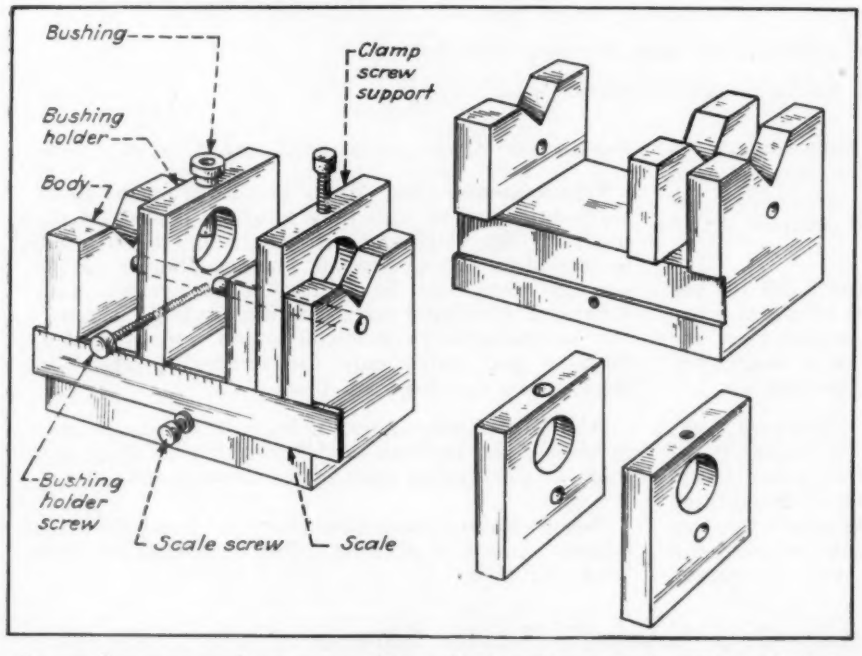


Slot Drill Jig Is Ideal for Short Run Production

H. MOORE

When longitudinal slots have to be cut into or through round stock, the method used depends a great deal on the production required. There are plenty of jigs to handle volume production of this kind of work, but very few that are designed for different diameters and various sizes of slots, especially for individual pieces of short runs. This jig does just that.

A V-block base is cut E-shaped to make 3 separate Vee's, two close together and a third at the far end. Just below, and on a line with the apexes of the three Vees, is a rod which holds and guides the other two major components. In the narrow transverse slot fits a clamp plate. This has a large circular opening in its center to clear the guiding surfaces and a knurled screw in the top to hold the work in place. Another similar piece is adjustable along the rod in the large transverse slot. Instead of the work-clamping screw, this plate has an accurate hole to receive the drill bushings. There is an adjustable steel scale along the side of the jig and the bushing member has a reference mark scribed on one end to be read against the scale. In use, the work is first clamped on the Vee. Next, the sliding bushing member is adjusted and clamped to drill one end of the slot. The scale on the side is then set to zero and clamped also. After the first hole is drilled, the bushing is slid along on the rod until the scale indicates that it has reached the other end of the slot. When this has been drilled, the intervening distance is divided up, and the rest of the drilling is done with care taken to divide the cutting (and bending) load on the drill evenly on both sides. To cite an example: The slot to be drilled is ¼ in. wide and 1¼ in. long. The procedure here would be to drill three holes in a row on ½-in. centers, making the extremes of the end-holes the required 1¼ in. apart and leaving ¼ in. between holes. Two more holes are then drilled, removing the remaining metal.

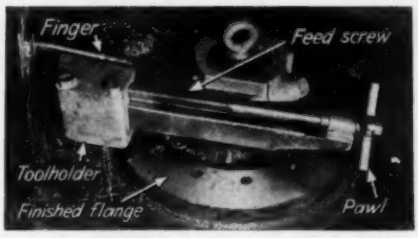


Square keyways and transverse slots in bar stock are made using a V-block to hold the work and a centered, sliding bushing to position drill

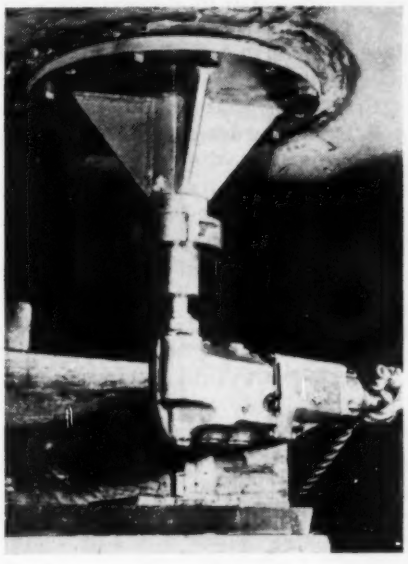
Portable Pneumatic Machine Faces Blind Flanges

JESS WILSON AND JOHN ZAHLER

Repair operations on heavy machinery sometimes provide some challenging problems. Usually, the work is too big to bring to the tool, so many tools have been built to go to the work. Once in a while, it's even worse than that. Here, it was necessary to refinish the inside flange on a large welded assembly which held a heavy bearing. The whole was the only access to the interior and so the tool had to be designed to get through the hole and operate on the inside.



Compact cutting head with automatic pawl and finger feed mounted in position for turning an interior flange



Bolted to the outside of the flange, the bearing support holds the spindle, thrust bearing and air motor rigidly in position

The answer was a welded-up flange and bearing to take the rotating spindle. This bolted on the outside flange. The cutting head, keyed to the end of the spindle, carries a radial screw terminating in a 4-tooth sprocket, and this pulls the toolholder inward along the ground guide. Here, the spindle is driven by a portable air drill.

To get an automatic feed, we devised a temporary finger to trip the pawl each revolution, by welding on a discarded bolt where the surface marring didn't matter. The tool is set up in steps. In this case, we dismantled it and inserted the head and spindle first, then put the spindle back in the bearing, and finally bolted the flange in place. A split collar locks the thrust bearing and provides axial spindle adjustment.

Peculiar Curved-Surface Intersections Scribed Easily

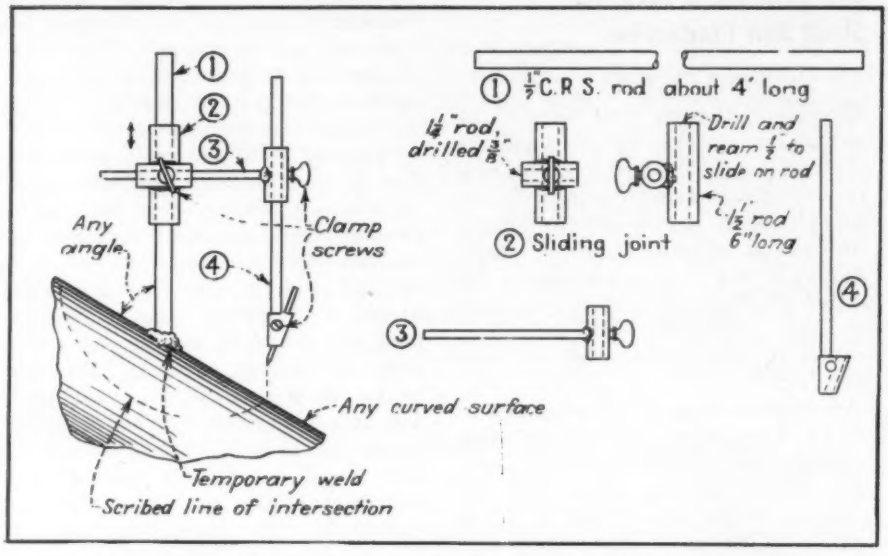
EARL R. GODDARD

Here's a handy tool which can be made in less than an hour for scribing the line of intersection of a circular pipe of any diameter on any surface. It was originally worked out to join a 10-in. pipe to a 4-ft. tank at a 30° angle, but once in a while there will be a spherical, conical, parabolical or some other surface which this device can handle with equal ease.

Presuming that the intersection is required in order to make a welded or brazed joint, the simple expedient of tack-welding the center-rod is resorted to. This can be any ½-in. rod. It is placed at the center of the intersecting hole and held at a cool distance at the proper angle and welded. The branch arm is adjusted in the cross to the correct radius and the scriber arm brought down on the pipe near the lowest point, where the angle between rod and surface is a maximum. The branch arm is then brought down on the center and scriber rods and clamped on the scriber rod. When the intersection line is complete, cut off the center rod near the weld and it's ready for the next job. •

When the hole is cut, the pipe can be placed in the hole temporarily to scribe the other line of intersection on it, if the pipe can't project inside at all.

It is possible, of course, to solve most regular curved intersection problems graphically, but it is always slow and there is considerable chance for error, and drafting equipment may not be readily available. Furthermore, spherical or compound curves, not necessarily regular at all, practically defy any but a cut-and-try method.



Quickly assembled rod scraps make this pipe-intersection scriber

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Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

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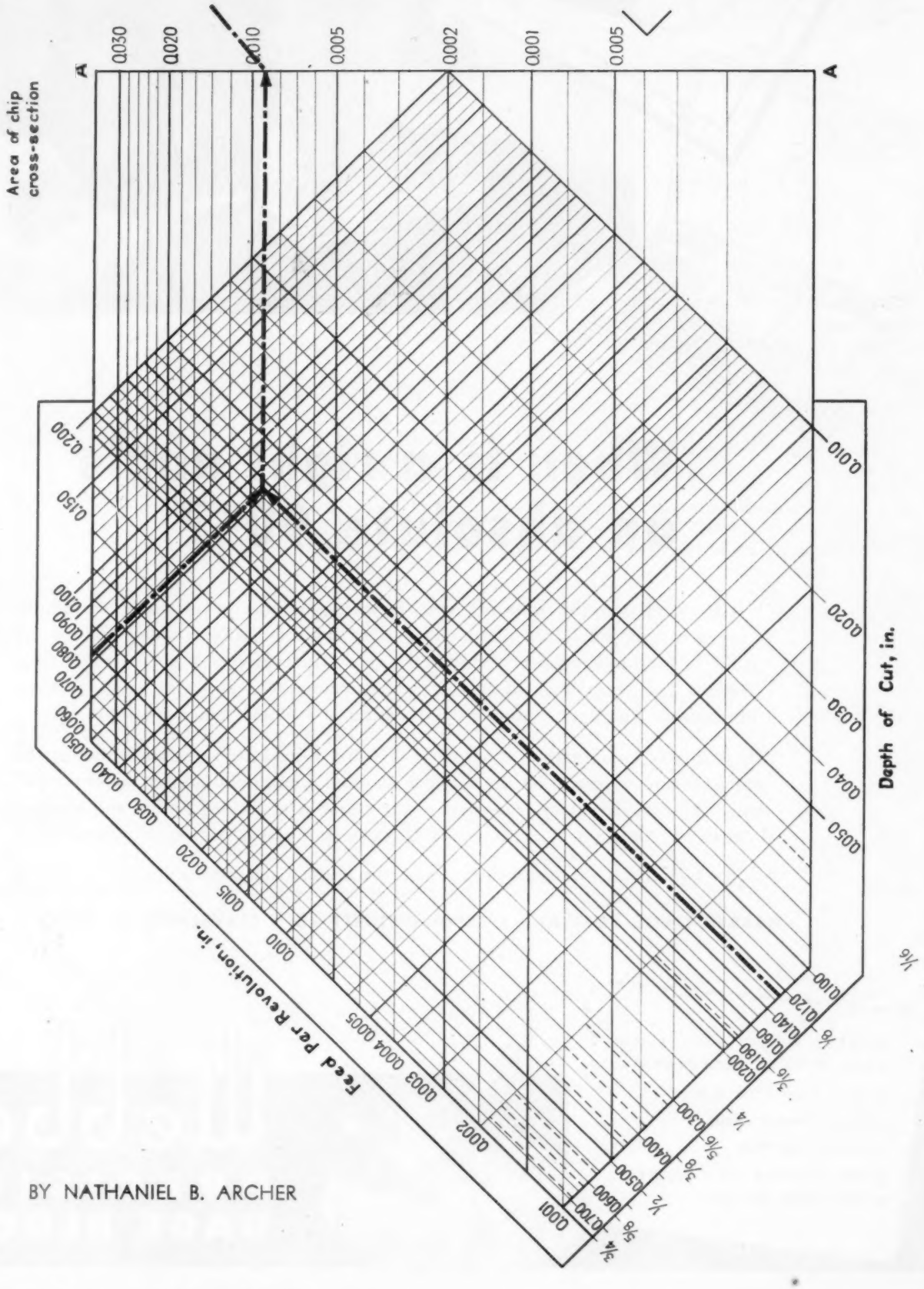
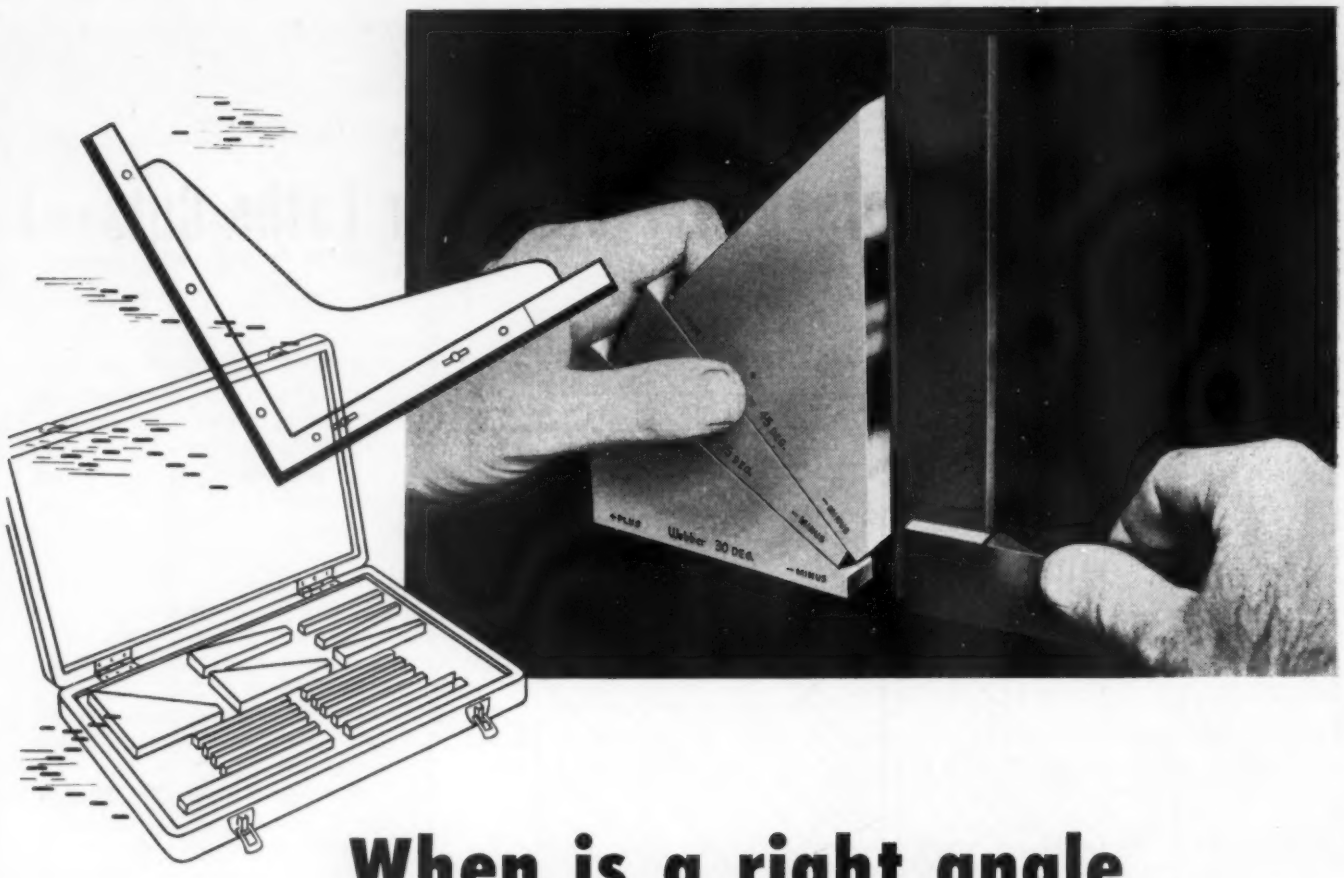
Tenth Selection—F. J. Lovejoy's Tubular Square

Horsepower Chart For Lathe Cuts—I



BY NATHANIEL B. ARCHER



When is a right angle an absolute 90°?

Right angles are the most frequently recurring angular measurements in industry, yet it is quite likely the absolutely perfect angle is being obtained for the first time in routine shop practice with the recently developed Webber Angle Gage Blocks. The simplicity of angular measurements is apparent in an adjacent illustration. The figure shows a combination of 3 blocks which total 90°.

By a similar combination as many as 356,400 separate angles are obtained. It simplifies and improves on the sine bar method. Compound angles are obtained easily. Absolute accuracy is assured as the proof is contained within the blocks themselves. An almost instantaneous check makes errors well nigh impossible.

Ask for bulletin that outlines shop practice in angular measurements.

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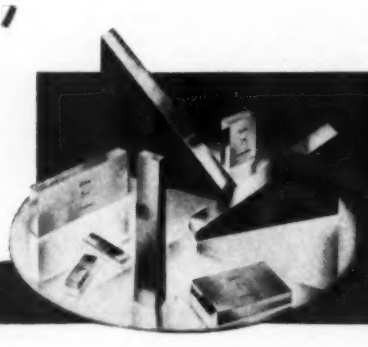


Webber
PRECISION
GAGE BLOCKS

Horsepower Chart for Lathe Cuts—II

BY NATHANIEL B. ARCHER

(Continued)

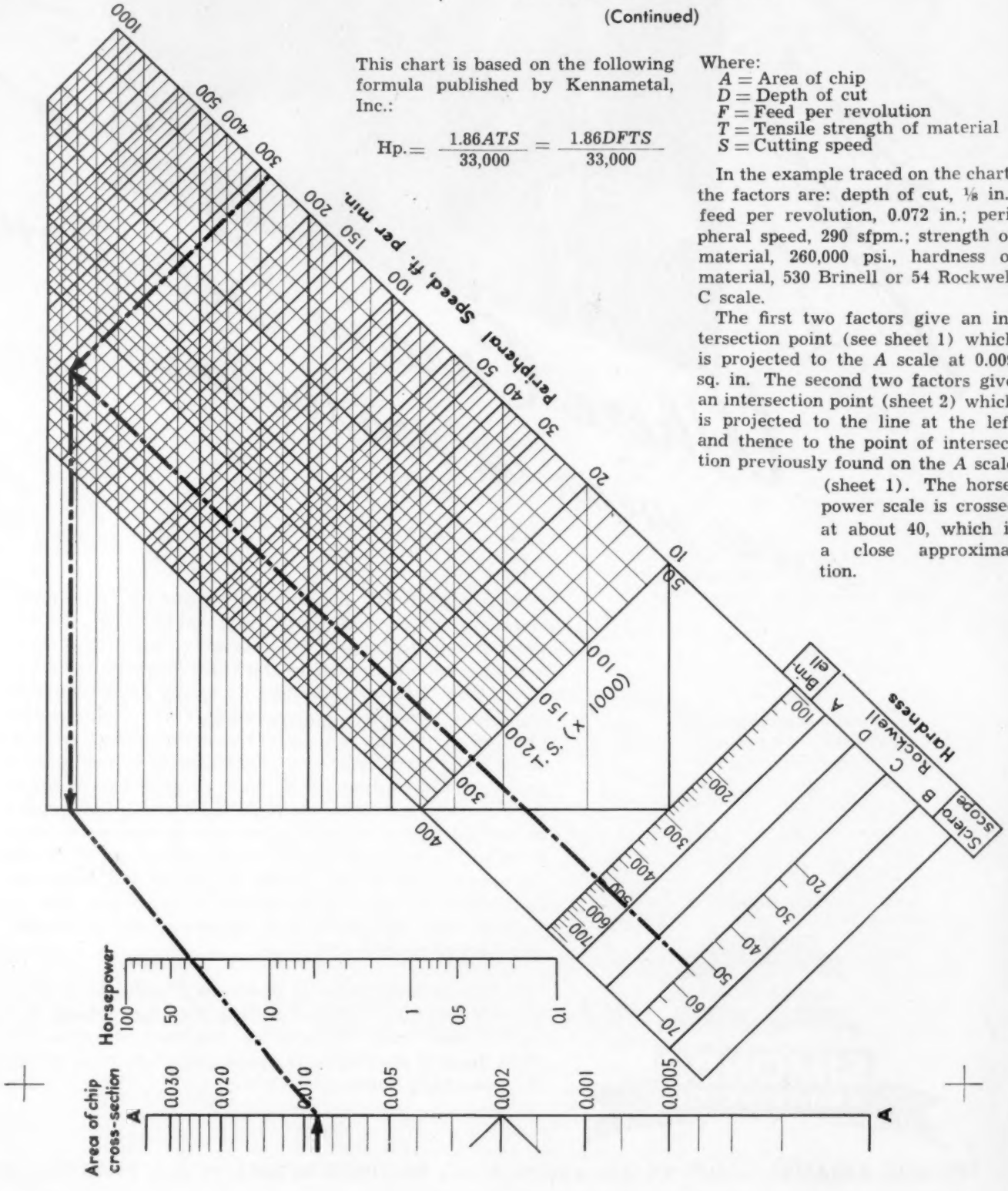
This chart is based on the following formula published by Kennametal, Inc.:

$$\text{Hp.} = \frac{1.86ATS}{33{,}000} = \frac{1.86DFTS}{33{,}000}$$

Where:
A = Area of chip
D = Depth of cut
F = Feed per revolution
T = Tensile strength of material
S = Cutting speed

In the example traced on the chart, the factors are: depth of cut, ⅛ in.; feed per revolution, 0.072 in.; peripheral speed, 290 sfpm.; strength of material, 260,000 psi., hardness of material, 530 Brinell or 54 Rockwell C scale.

The first two factors give an intersection point (see sheet 1) which is projected to the A scale at 0.009 sq. in. The second two factors give an intersection point (sheet 2) which is projected to the line at the left and thence to the point of intersection previously found on the A scale (sheet 1). The horsepower scale is crossed at about 40, which is a close approximation.



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NEWS OF METALWORKING

Machine Tool Shipments Slowed by Shortages; Order Backlogs Uneven

CLEVELAND — Although the machine tool industry is expected to ship some $350,000,000 worth of equipment this year, material and parts shortages will continue to curb monthly shipments over coming months, and competition for business among builders has been greatly intensified. While the industry's backlog totals $184,000,000, as of the end of July, many of the smaller plants are having trouble getting new business since they contend that about 60% of the backlog is in the hands of a few big builders. The over-all industry backlog averages six months' shipments, but many firms only have one or two months' business on hand.

Small Firm Hit

The relatively unfavorable position of some small firms accounts for their not taking full advantage of the last price increase allowed the industry by OPA. Smaller companies are facing greater competition from the larger firms in selling, since the latter are strengthening sales staffs and establishing more branch offices. In some cases, they have switched from dealer set-ups to direct selling largely due to increased demand for special machines and more technical information.

On the other hand, some small shops have the advantage of flexibility of operation and a small overhead. But the greatest asset for the smaller builder right now lies in the small size of his labor force, which usually results in closer relationship between management and workers. In many cases, the employees are willing and anxious to assume a degree of responsibility for the success of the company and the quality of the product.

Remaining Shortages

Material shortages have been the major handicap to sustained operations with motors and castings particular problems. Although strikes in the plants of motor manufacturers are now over, their output has been curtailed by shortages of copper wire. It will be several months before the effects of resumed production will be felt in the plants of machine tool builders.

The castings shortage is made worse by reduced supplies of pig iron, as steel mills divert more iron into open hearth furnaces to make up for the current shortage of scrap. The small increase in pig iron prices allowed by OPA only intensified this trend in the steel industry.

A bright spot in Ohio was the reopening of the Struthers Iron & Steel Co.'s blast furnace on September 1st. The Struthers unit is a merchant iron furnace, but has been idle for nearly a year because price ceilings did not permit operators to meet high costs for this old furnace. Now the unit, with a 500-ton daily capacity, will be operated under lease to Kaiser-Frazer Corporation.

Three large furnaces are still closed and may not reopen under present pig iron prices: one at Everett, Mass.; one at St. Louis; and a DPC unit at Gadsden, Ala. These shutdowns, diversions of more pig iron into steelmaking, and allocations for housing, farm equipment, and railroad brake shoes, serve to cut the supply available to other pig iron users.

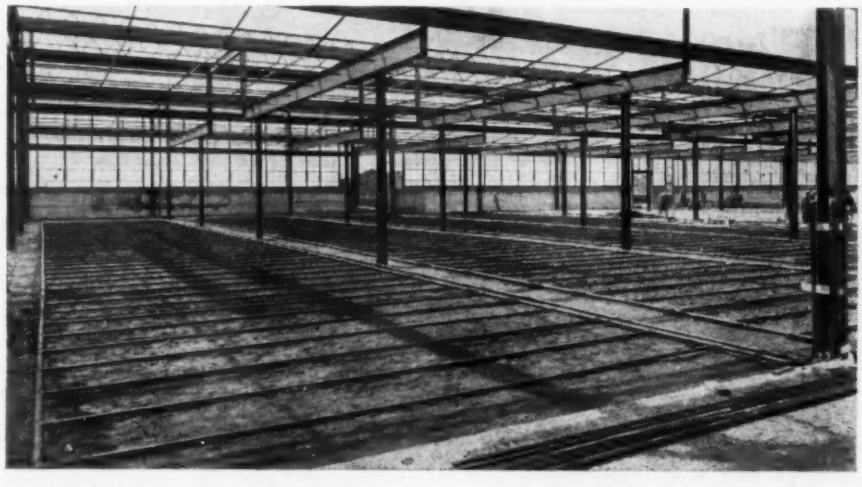
Other Bottlenecks

Lack of bearings has been a handicap, but this is only considered temporary. Other difficulties include lack of small but essential parts such as electrical switches, copper wire and even lumber for shipping crates, which have served to check total shipments.

Skilled manpower is becoming increasingly scarce, and employers are having difficulty in securing personnel for the second and third shifts. In competition for workers, shops offering overtime have more attraction for workers. However, few plants need more workers, and the industry's employment today is relatively low. Figures compiled by the National Machine Tool Builders Association for May, 1946, showed 59,000 workers building machine tools, as against 72,700 a year ago, and the December, 1942 peak of 122,600 workers.

HENDY SUBCONTRACTS NORDSTROM VALVE ORDER

OAKLAND, CALIF.—Nordstrom Valve Co. has arranged to clean up its backlog of orders by arranging a subcontract with Joshua Hendy Iron Works, San Jose, Calif., who will manufacture plug valves in sizes 20 in. venturi and 8 in. round opening. The subcontract work is expected to reach a volume of $4,000,000 a year.



Radiant Heating System of New A. O. Smith Plant—The new Kankakee, Ill., plant of A. O. Smith Corp., expected to start operations late this month features an ultra-modern radiant heating system. Heat is provided thru circulation of hot water in pipes in the floor or coils in the ceiling. The $3,000,000 plant has 40 miles of wrought iron piping and copper and steel tubing such as that shown here. The heat is furnished by 120 volume water heaters operated on natural gas

Gaging Business

Materials Situation Improved

Despite bottlenecks, the materials situation has recovered substantially from the impact of strikes of recent months. With steel operations back to 90% of capacity, and new blast furnaces starting up, the flow of pig iron and steel has been increased steadily. Moreover, aluminum and magnesium plants are helping to make up the deficit in steel by turning out more sheet, strip and castings, while plastics production continues its upward climb. The result is that industrial pipelines have been partly restored, and even this partial restoration has brought unprecedented output of durable goods.

Nonferrous metals remain in limited supply, partly due to the price gyrations engendered by government authorities, which serve to discourage marginal mine production, reduce imports, and confuse the flow of copper, lead and zinc. The case of lead is a good illustration of government interference with the production flow. Although lead prices rose to 9½ cents a lb. during the temporary demise of the OPA, government officials have attempted to bring the price back to 8¼ cents, which leaves many fabricators with supplies of the metal purchased at higher prices. Chances are that such lead will be held off the market until the situation is rectified.

Small Problems Are Many

But industry must still overcome nunmerous small problems in order to maintain operations at current levels and go forward to even greater peaks. Foremost among them are the continuing scattered strikes holding down production of automobiles, farm equipment and household items. As these strikes are solved, new ones spring up to maintain the over-all retarding effect on our economy. Moreover, there is always the possibility of renewed large strikes as labor tries to figure out a way to get more raises without increasing prices further.

Another growing problem is the strain on our transportation system imposed by the record peacetime flow of manufactured materials, raw materials, and large grain crops. Steel manufacturers are favoring railroad car builders in their shipments in order to help lift output of freight cars from the recent level of 4,000 cars monthly to around 8,000. But transportation bottlenecks will continue, since it is estimated that about 100,000 freight cars additionally would be needed to ease the present situation.

Steel Price Maneuvers

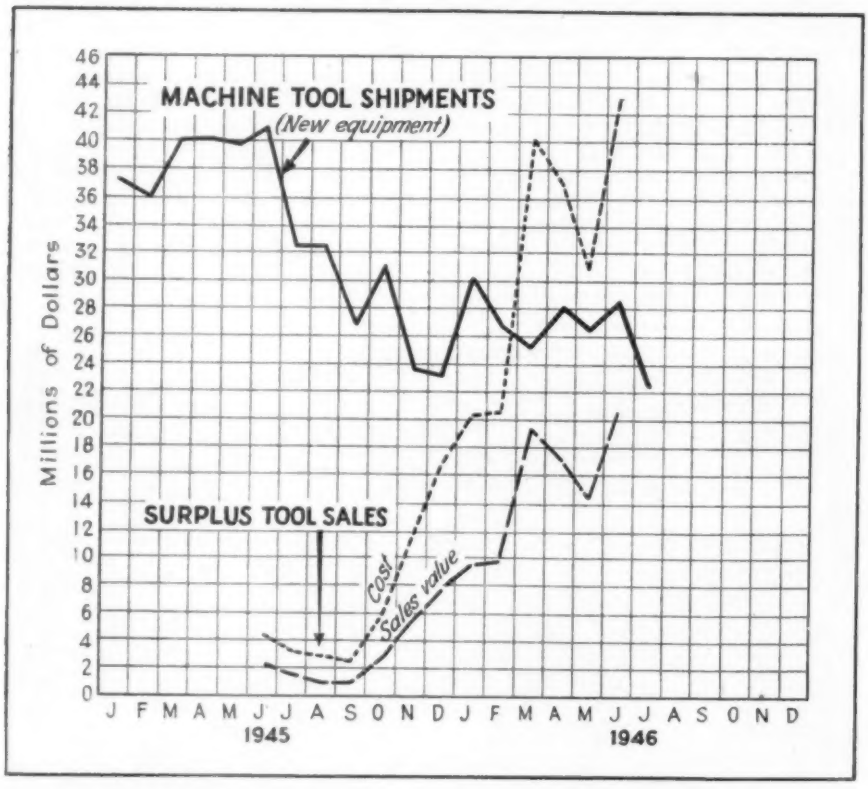
OPA action on steel prices continues to shunt production away from items offering low profit margins, such as wire products, reinforcing bars, and nails. Although this has handicapped users of these products for months, OPA has done nothing to rectify the situation. Its recent allocations for housing, farm equipment, and railroad brake shoe equipment only helped those consumers, but made things even worse for others. Over all, there is the necessity for a general upward adjustment in steel prices to offset higher costs including higher coke and pig iron prices, and increased freight.

What complicates the steel industry's price problems further is the probability that scrap prices will have to be increased to stimulate the flow of this material to the steel mills. The steel industry's scrap backlog is estimated at about 50% of normal, even though it should now be accumulating this material as a winter reserve.

Surplus Equipment Bogs Down

It is reported that the War Assets Administration plans to sell surplus machine tools in long supply at discounts from 24-45% off the original value. The offer would hold for 90 days at the end of which time, such items as are not sold will be put under the drop-hammer and broken up for scrap, after motors and electric controls have been removed for sale. Although the motor industry is now turning out record numbers of motors, such surplus motors will have ready sale. WAA figures that by doing this, it will be cheaper than having them skidded, wrapped and stored.

The step may have also been motivated by the fact that WAA has only sold about one-third of all surplus equipment declared, with most of the good items combed out and those remaining harder to sell. Moreover, demand for new and used equipment has been slackening, partly due to federal limitations on industrial construction.



Surplus Machine Tool Sales Hit New Record—Sales of surplus machine tools by the War Assets Administration hit a peak of $43,068,000 worth in June, sold for $20,502,000. This was up from May's sale of $30,757,000 worth for $14,415,000. In contrast to this, July's shipments of new machine tools fell to the lowest level since the war, or $22,350,000. The drop from June's shipments of $28,580,000 was largely attributed to material and parts shortages. The machine tool industry still had a backlog of $184,968,564 at the end of July, although July's new orders had dropped to the year's low

Steel Price Boost Likely by Yearend; Ratings Hamper Rising Mill Output

PITTSBURGH — Steel producers, while continuing to wrestle with their problems of scrap shortage, scarcity of railroad cars, and a nip-and-tuck battle to keep sufficient coal supplies on hand, are once again looking forward to an upward revision of the steel price structure. The new price law requires a re-examination of steel quotations, and industry-wide increases are required where it is shown that ceiling prices do not reflect 1940 prices plus average increased costs.

Under this new amendment to the new price control law, it is considered a cinch in many quarters, that steel prices are destined to go higher. The General Steel Mill Products Industry Advisory Committee recently authorized its chairman to gather new cost data for the industry and write a petition for price boosts.

It is not expected that OPA will take any action until late in the year, probably after elections at the earliest. Most interests doubt that the increase will come to as much as $2 a ton.

Output Rising

Steel production is making an impressive record in the Pittsburgh district, but rates are lower elsewhere due to scrap shortages. At a steady 100% rate, Pittsburgh is more fortunately situated than the Chicago area, which has been hard hit by scrap.

Consumers are obtaining more finishing steel today than at any time since the end of the war, but demands are far from being satisfied. Steel fabrication and processing is still beset with a flow of various materials to the end that durable goods are processed by fits and starts and inventories tend to pile up as essential parts are unavailable to complete shipments.

Ratings Change Mill Runs

There is much confusion on sheet and strip, although output in this area is proceeding at a high rate. Runs have had to be revised often on sheet mills to take care of rated tonnage and non-rated consumers have been receiving less material under quota than they had been led to expect. Rated tonnage for the fourth quarter has not yet been compiled and is constantly subject to change. Attempts to eliminate part of carryover from one quarter to another to reduce backlogs have met with objections by major consumers. The boxcar shortage has delayed some movement of tinplate, but not enough to restrict output.

In practically all heavy items there is little prospect of placing any new tonnage for 1946 delivery and in most cases books are not open for 1947. One exception is structural steel on contracts, but the large backlog in shapes is discouraging to builders. Priorities in small shapes for rail equipment makers and rated building is also upsetting shape output.

Pipe and wire mills are heavily obligated into at least the first quarter of 1947. Allocations to plate mills and bars are made after steel requirements of other finishing mills are filled.

DuPONT RELINQUISHES ATOMIC ENERGY PLANT TO G.E.

WILMINGTON — At midnight August 31st, the E. I. du Pont de Nemours & Co. turned over to General Electric Co. all of its duties and activities under its contract with the government in the atomic energy program. At that time, General Electric took over operation of the Hanford Engineering Works at Richland, Wash.

Du Pont in the fall of 1942 agreed to the government's request that it design, construct, and operate the plant for the production of plutonium, asking that it be relieved of the task as soon as possible. All patent rights involved are the property of the government.

WAA Readies New Plan to Offer Machine Tools to Institutions

WASHINGTON—A plan for sale by WAA of machine tools and other equipment in long supply to non-profit educational institutions at 6% of the Clayton formula price is due for announcement.

WAA says the price to schools has been 40% of the Clayton price, with hardly any takers. Officials of the agency have admitted failure of the give-away program, blaming schools for lack of interest.

At the same time, some schools are complaining they never heard of any WAA donable property, and could learn nothing upon inquiry. One school recently asked the Cleveland Office of WAA and the U. S. Office of Education in Ohio how to get WAA machine tools, and learned nothing.

A WAA official in Washington recently misinformed AMERICAN MACHINIST that machines were available free of cost to any schools who would bring a truck and get them.

Items In Long Supply

WAA has prepared a list of equipment in long supply or perishable for mailing to state departments of education, which are responsible for distribution to all schools. The list totals about 48 items, including milling machines, drill presses, cylindrical grinders, arbor presses of various types, slotters, double end grinders, gear cutting equipment, some types of planers, profilers, some sizes of surface grinders, plenty of tool and cutter grinders, etc.

WAA regions also are getting these lists, and are urging schools to submit lists of what they want, so far with scanty response. Officials feel that, though WAA has failed to press it donation program, the schools now will have their opportunity and must take the initiative.

Army and Navy are authorized to give away surplus goods because they are owning agencies; WAA owns nothing, is merely a sales agency, and therefore must collect something, which explains the old 40% charge and the new 6% price. Responsible men in WAA say the charge is based on legal palaver.

International Technical Group To Meet in Paris Sept. 16-21

PARIS—For what is believed to be the first time in history, an International Technical Congress, to be held in Paris from September 16-21 will bring together engineers and technicians from all fields from all parts of the world. The congress has been organized by committees of engineers in 14 countries, primarily to interchange technical information and discuss social and economic problems of particular interest.

Under the Presidency of Col. Aristide Antoine, of France, the Congress will consider informally the creation of an international federation embracing all engineering professions. The body would work closely with the United Nations Educational, Scientific and Cultural Organization.

The U. S. committee for the Congress is presided by C. E. Davies, secretary A.S.M.E. Members include: W. N. Carey, Secretary of the A.S.C.E; A. B. Parsons, secretary of the A.I.M.ME.; H. H Henlines, Secretary of the A.I.C.E. About 130 papers will be delivered at the Congress, and copies may be secured from General Secretariat, 27 rue de Constantine, Paris VII.

Labor Uncertainties Worry Chicago Firms; More Surplus Plants Bought

CHICAGO—Earlier predictions that Chicago area manufacturers would get through the balance of 1946 without important labor troubles are beginning to look doubtful. The Great Lakes shipping strike has been felt by a number of industries, and the possibility of renewed difficulties with coal miners growing out of the Sept. 10 conference between the mineowners and the UMW has industry worried. The effects of the last coal strike were felt more keenly in Chicago than in most other production centers.

The long drawn out Allis-Chalmers and J. I. Case strikes point to the determination of unions in the metalworking fields to gain their objectives. The Allis strike has had wide repercussions, as the company supplies components to numerous manufacturers.

While they do not affect metalworking directly, management men are carefully watching the large Chicago meat packing and printing trades unions for indications of labor trends. Both packers and printers are faced with demands that may erupt in a series of strikes; if the demands are granted, they will set the stage for similar requests by steel workers and other unions.

45% Have No Unions

The Employers' Association of Chicago has completed a survey showing that 45% of the firms covered in the Chicago metropolitan area have no unions. The survey covered 500 companies. Altogether there are about 780,000 manufacturing workers in the area. Of the 55% of the companies that have unions, the study disclosed that 65% are AFL and 35% are CIO.

The survey also showed that the average wage rate in Chicago area metalworking industries was $1.06. For all the industries covered, wage increases since Jan. 1, 1941, averaged 46.3% and the average granted since V-J Day was 12%.

Reopening Labor Contracts

Most union contracts rewritten in the last year carry a general reopening clause on wages—equivalent to a day-to-day contract on wages.

In plants with CIO contracts, there is a concerted effort in this area to organize office workers. Harvester has barely averted an office workers strike. However, of the plants in the Chicago area only 2% have unionized office workers.

Interest in surplus war plants continues at a high level in Chicago. By Sept. 30 bids for 22 plants in the Chicago area with a total cost of $400,000,000 will be taken by WAA. The plants include the South Chicago Republic Steel plant and the East Chicago Inland Steel plant. Henry Kaiser is reported interested in both properties. Other plants to be disposed of include the Kenosha, Wis., Nash-Kelvinator plant, the East Chicago American Steel Foundries plant, the Anderson, Ind., General Motors plant, and ordnance plants in Milwaukee and Des Moines.

Several midwest plants may be split up for multiple tenancy by WAA. They include the Carbondale, Ill., ordnance plant covering 22,000 acres with 500 buildings; the Green River ordnance plant, Dixon, Ill.; the Evansville, Ind., ordnance plant; and the Dow magnesium plant at Marysville, Mich.

Plants already sold in the Chicago region by the government have brought between 60% and 70% of their cost. The demand for plants has been so great that in the city of Chicago only four small pieces of industrial property are unsold.

Diamond T Motor Car Co. has resumed truck output after a strike, and hopes to turn out 6,000 units in the remainder of this year. Backlog of orders will carry production through 1947. The company is considering adding a station wagon to the line, although production would not start on the new model for at least a year. Even though Harvester is handicapped by strikes of suppliers, the company turned out 2,700 motor trucks in a recent week, almost 100 more than in the comparable 1941 week.

Bobbi Motor Car Moves to Birmingham; To Make 800 Low-priced Cars Daily

BIRMINGHAM, ALA.—The Bobbi Motor Car Corp., San Diego, Cal., has signed a five-year lease for about 700,000 sq. ft. of space in the wartime modification center of Bechtel-McCone Corp. here. The company, which will make a lightweight car in the popular price range, will move its entire production, promotional and distributing staff here.

S. A. Williams, president, said machinery will start moving to Birmingham in the immediate future, along with the company's key personnel from San Diego. Within three to four months, dealer display cars will be off the production lines.

$700 Price Range

Depending upon the availability of parts and supplies, it is expected that production will be expanded to 800 automobiles a day, or not less than 200,000 units a year. Initial production calls for a coupe and a package wagon, but the company's line will also include a convertible sports roadster, a station wagon, and a sedan. Prices have not been accurately determined, but the range will be around $700.

According to Mr. Williams, overall length of the car is 152 inches, with a four-cylinder motor developing 25 hp. It will have a 92-inch wheel base, a turning radius of 14 ft.-10 in., and 450 by 12 tires plus hydraulic brakes. A principal feature will be the no-spring, torsilastic suspension of the frame that requires no lubrication.

The corporation will manufacture its own chassis. Its suppliers, Mr. Williams said, include Continental Motors and Hercules Motors, Warner and Advance gears, Kelsey-Hayes for wheels, Goodrich and Goodyear for Tires, Federal and Timken bearings, Young radiators, Libby-Owens-Ford glass, plus several others.

Official Named

The company's officials include M. L. Howard, vice-president and secretary; vice-president in charge of production is J. L. Liefeld, formerly with Chrysler; chief engineer is Joseph Bretauad, for years a pioneer in the manufacture of small cars in France; J. D. Carter, chairman of the board, formerly with National Cash Register Co.; R. Christman, chief of the tool engineering project, formerly of Continental Engineering Co.; and Marty Bonar, formerly of Westinghouse, as works manager.

In addition to the Birmingham plant, the company is perfecting plans for an assembly plant in Canada, and negotiating for another in India. Production here will be in the large flight building and five bays of the modification center, rented for $150,000 annually. About 10,000 to 12,000 employees will be required eventually with a payroll rising up to $30,000,000 annually.

Detroit Letter

Copper Shortage Bad

Once more, worry over forthcoming automobile production is acute in Detroit. Sheet steel, the major bugaboo of the past, has dropped to an approximate fourth place in the headache list, having been overtaken by copper, lead and pig iron, in that rough order.

Despite the fact that Calumet & Hecla Consolidated Copper Co. is building a new plant in Decatur, Ala. (its Wolverine Tube division in Detroit can expand no further to meet tubing demand), and despite the heroic efforts of other copper fabricators to increase output, demand is swelled far beyond visible supply today. This is best evidenced by recent figures indicating unfilled orders at the start of August totaling more than 800,000 tons, against shipments of less than 100,000 tons per month.

Not only does this situation stymie the auto industry from increasing its output, but the dwindling supply actually indicates curtailments ahead unless a change occurs. General Motors is known to have tried in Washington to obtain permission to import red metal from abroad, with no immediate success. G. M. and other producers, meanwhile, all have envious eyes trained on a large government stockpile, but so far have been unable to get close enough to it to do them any good.

Lead, Pig Iron Tight

Lead is in somewhat comparable situation, so much so that little need be said on that score. Where copper is required for radiators and tubing, lead is needed just as essentially for batteries, body solder, and other needs; without one or the other increasing in availability, car production will surely slump.

Pig iron is increasingly tight, a condition born of the short scrap supply, the breakdown of numbers of blast furnaces, last winter's steel strikes, and other factors. One source estimates that blast furnaces must run at 80% of capacity today to break even with demand for open hearth and foundry cupola requirements.

The simple non-existence of pig iron contrasts with a greater riddle in steel. The riddle is: Where are the sheets going? Some manufacturers believe the answer is that the automotive proportion of sheet business has been sharply reduced in the face of increases for home and commercial appliances, construction, machinery, containers and other avenues. Detroit does not like this at all, and is making no bones about saying so.

1947 Models

If it were not for the large worries over the ability to continue production ahead, the top gossip subject today would be the fact that there will be 1947 models after all.

Actually, they will be less "new" than even some of the scant prewar year-to-year changes when business was good. One company set up this criterion for its production men: "If you can retool for the change during the period of a normal inventory, inside of a week, then go ahead."

So it is that some new grillework will be tacked onto front ends, interiors will be juggled around, hubcaps changed and decorative trim shifted—and the result will be 1947 models.

They will start into production late this year, whenever then-current scheduled production runs are finished. Sometime between Thanksgiving and New Year's is the indicated time for the change-over, pointing to public announcements early in January. The timing does not indicate a precedent. Plans still call for an end to these 1947 models by midsummer.

Peak Employment

Almost unnoticed in the news is the fact that Detroit industrial employment stands today at an all-time peacetime high. As of mid-August, the index figure of the Detroit Board of Commerce stood at 139.2, and when the reports are all in it is expected to show higher as of Sept. 1. But the Aug. 15 level compared with a 1941 high of 123.8, and a prewar all-time record of 137.8 reached on Mar. 15, 1929.

Even so, hours worked still do not round out a full week. The Michigan average for July, latest figure available, shows a statewide average of 38 hours, automobiles and parts by themselves standing at 35.7 hours. That level has probably been somewhat improved since then, but it is still far less than what would be expected with such a huge payroll total.

Inefficiency, of course, produces another discrepancy, as between payrolls and production. Shop men continue their position that efficiency is certainly no better than 75% or so of normal, on a general average, for all plants. The result is a series of auto production weeks of less than 100,000 assemblies put together by peak payrolls, as contrasted with output weeks of 140,000 or so in 1929 and 1941, built with far less people at work.

Unbalanced Inventories

Inefficiency and materials shortages are problems in the shops; in the front offices some of the by-products of those unhappy circumstances are creasing the brows of financial men. They do not quite know what to do about inventories.

As generally reported earlier, inventories are out of balance, badly. The shocking extent of the unbalance is well indicated by recent confidential reports which point to one major firm, typical of the auto companies, as having total inventory today about 25% in excess of a peacetime normal, and turnover less than half as fast—10 weeks or so against a normal one month. And this company is facing stoppages, because its swollen stockpiles have a few gaping and critical holes in them.

"Personalized" Buick Convertible—Production has been started on this streamlined 1946 convertible featuring push-button controls for the top, windows and front seat which operate only when the ignition is on. The cars are produced in two series—the Series 50 Super on a 124-in. wheelbase and the Series 70 Roadmaster on a 129-in. wheelbase

March 1947 Machine Tool Shipments to Rise 10%, CPA Says; Twice 1939 Level

WASHINGTON—Projected October 1946 and March 1947 dollar shipments of machine tools, and employment in the industry, are at a level about 10% above the June 1946 figures, according to a Civilian Production Administration survey of 1000 large plants representative of 50 metal-working industries.

In June, the survey says, dollar shipments were at a rate about half the peak war rate, but almost double the 1939 monthly rate; employment was about 75% of the war high, but 1.75 times that of 1939.

Estimated '47 Shipments

Reporting manufacturers estimated March 1947 dollar shipments will be roughly half the wartime high and employment will be 23% under the war high. Both dollar shipments and employment in March are projected at twice 1939.

Past and projected trends in some other industries are roughly the same as in machine tools: namely automotive, electrical; bolts, nuts, washers, rivets; cutlery and edge tools; machine shop products; machine tool accessories; mechanical measuring instruments; mining machinery; power boilers; pumping equipment; compressors; and some special industrial machinery.

The metal-working industries have re-converted so successfully, CPA says, that in June, 10 months after V-J Day, their dollar shipments were 2.5 times prewar and their employment twice the average pre-war month.

Manufacturers expect metal products shipments in October to exceed June by 16% and level off around the yearend, rising 5% in 5 months to March, while employment increases 5% June to October, and 3% to March.

Shipments of machinery and producers goods, which account for the largest part of the industries covered, are expected to level off from now on, while a great rise is still to come in consumers durable goods.

SHEFFIELD CORP. PURCHASES THREADWELL TAP & DIE CO.

DAYTON, O.—The Sheffield Corp. has purchased the plant and equipment of the Threadwell Tap & Die Co., Greenfield, Mass., for forty years an important maker of small tools. Officials of the Sheffield Corp. have stated that no changes in the duties or responsibilities at either plant are contemplated for the present.

Sheffield Corp. has four main divisions manufacturing gages, precision measuring instruments, machine tools, and provides a contract engineering and manufacturing service. Acquisition of Threadwell Tap & Die permits a further expansion of its service.

Herbert J. Smith is president of Threadwell Tap & Die, William Scott Keith is secretary-treasurer, and W. B. du Mont is vice president in charge of sales. Mr. Keith, principal stockholder, is resigning to devote his time to other business interests in Greenfield.

WESTINGHOUSE PRODUCTION OF SMALL MOTORS OVER '41 PEAK

PITTSBURGH — Westinghouse Electric's output of small motors is now 33% above the 1941 peacetime peak, and is expected to reach a further peak in February, 1947, according to C. C. Shutt, division manager at Lima, O. Strikes at Westinghouse and General Electric had interrupted output of electric motors for several months, and this had hampered production of various consumer items, as well as industrial equipment, including machinery.

Westinghouse has a $2,000,000 expansion program underway to increase motor output. Plan includes adding new equipment and redesigning assembly lines.

Auto Industry Displays Resourcefulness In Getting Labor; New Dodge Truck

DETROIT—Among recent activities of the resourceful auto industry, one of the most outstanding was the novel way General Motors decided where to locate its new foundry in Ohio. It optioned sites in Defiance and Tiffin, then ran identical ads in the local papers, saying in effect that the company would move wherever it appeared to be lining up the largest labor source. In Defiance, 3,126 persons applied for the 2,000 foundry jobs; in Tiffin, 2,625 turned up. Skilled interviewers eliminated curiosity seekers, incompetents, even possible ringers imbued with civic zeal, and finally decided on Defiance. The new plant will be completed by next April.

Ford Saves Manpower

From Ford, meanwhile, comes word of two activities of manufacturing significance. The company has turned its back on precedent in assigning a contract to F. H. McGraw & Co., engineers and builders, for purchases and installation of new production equipment in the branch plant being erected at St. Louis. This $3,000,000 deal is the first Ford has made for purchase and installation of a complete assembly department. Since this was heretofore a function of the company itself, it is believed that this step was prompted by insufficient manpower at Ford.

At River Rouge, meanwhile, Ford is moving its cold-heading department out of cramped quarters in the basement of the rolling mill, into the armor plate building, recently bought from the government. The building will be remodeled and equipped with new conveyors. In all, some 800 machines will be installed in it. Peak employment will continue around 1,200 men in the department.

Dodge Truck Features

Mechanically, Dodge truck division has more to talk about on new models than most producers. Its newly announced line of 2½- and 3-ton trucks, heaviest Dodge has yet to put out in peacetime with gasoline engines, boasts many changes.

For one thing, sodium-cooled exhaust valves, stellite-faced, are used. White Motor Co. employed sodium-cooled valves before the war, and they were widely used on aircraft engines. But their installation in the Dodge line gives them a good shove toward volume use. Dodge's new clutch employs 16 springs thrusting on the plates all around the diameter, enhancing evenness of pressure. Con rod bearings consist of a layer of copper-lead alloy and lead-tin alloy, bonded together and laid onto a steel back.

Savage Arms to Make Washing Machines, Refrigerators at Utica

UTICA, N. Y.—Transfer of munitions-making machinery from the Utica plant of the Savage Arms Corporation to the Chicopee Falls plant will be completed by the end of the year. The Utica plant will be used to make washing machine and refrigeration equipment.

Washington Bulletin

Undersea Cargo Vessels

Navy and Maritime Commission are investigating the possibilities of undersea cargo vessels to escape attack by swarms of long-range combat planes flown by whomever controls the seas in future conflict. The idea is not new but it's changing from popular mechanics to strategy. There is no doubt that big submarines can carry freight and personnel; the main problem is disposition of engine exhaust during long submersions. Atomic power is the answer, if and when it works.

Small Zinc Releases

Civilian Production Administration recommended resumption of zinc releases in small quantities from the government stockpile administered by Metals Reserve. In July, production failed to meet demand, mainly because OPA refused to grant higher prices to producers, and the deficit was made up in withdrawals from government reserve, which, however, were discontinued in August because the stock was shrinking. CPA called for further releases again, for the same reason: non-production because of dissatisfaction with prices. CPA makes materials policy and there was little doubt Metals Reserve would comply.

OPA's second big price de-control order on producers equipment is really broader than it looks on the face. The order specifically listed decontrolled equipment by industrial categories. OPA now says such equipment is de-controlled, whether or not it is purchased for use in the category in which it was listed. Example: all chemical equipment was listed in the order but some items in this class are used by other industries.

Contract Settlement Ruckus

Lindsay C. Warren, comptroller general, in his fervor for upright government, sometimes goes out on limbs looking for wrong-doers. Recently, testifying before the Mead Committee, he implied that the public had been bilked of large sums by the Office of Contract Settlement in terminating war contracts. H. Chapman Rose, OCS director, has fired a hot reply charging: (1) that Warren contradicted himself three days earlier in reporting to Congress that there was no basis for criticising contract settlements, and (2) that the comptroller, contrary to his complaint, has authority to search for fraud whenever and wherever he wants to. Warren had claimed he was compelled by law to wait for outside information.

German Patent Settlement

Accord on disposition of wholly-owned German patents has been signed by U. S., Britain, France, and Netherlands. Under the agreement, a U. S. firm, for example, can obtain a royalty-free license to produce items for sale, say, in France, without interference by interests there who might own the same patent. The accord, which will go into effect when three more signatures are affixed, covers about 100,000 German inventions and techniques. They will not be available for several months.

Surplus Progress

War Assets authorized Army, Navy and other owning agencies to dispose of surplus unsalable machinery as scrap and salvage. The order covers turning machines, bomb manufacturing machines, slotting machines, cartridge machines, shell lathes, grinders, shell tappers, special end mills, sliding head mills, swivel rotary mills, duplex spot face mills, planetary mills, and other special purpose machines, totaling about $75,000,000 acquisition cost.

Re-sellers of certain machines and equipment may raise their prices, in compliance with the OPA extension law, which provides that distributors are entitled to average current costs of acquisition plus average markup in effect March 31, 1946. Gears, pinions, sprockets, speed reducers and chains, get 13%; gear motors 13 to 27%; fans and blowers, fractional, 9%, 14% for integral h.p. motors.

BARRETT NAMED HEAD OF NEW WAA SALES DIVISION

Clarence A. Barrett, formerly a metalworking plant engineer and adviser to the War Production Board, recently was appointed director of Metalworking Equipment Sales Division of the War Assets Administration, in Washington.

Mr. Barrett was chief of products research division of WAA in Detroit from August, 1944 until his present assignment. During the war he was with WPB's machine tool division at Detroit, procuring and allocating tools to plants, and checking bottlenecks.

British Car for the Disabled—All controls in this miniature car are placed in normal positions, but are adjustable to fit the individual needs of disabled persons. S. E. Jones, British ex-serviceman of World War I, is shown investigating the controls of the new "Lamar," a single-seater with a 2½ hp. engine. With the engine at the rear of the car, it will cruise at 35 m.p.h. and travel 65 mi. on a gallon of gasoline

Only 10% of Japan's Machine Tool Plants Ravaged by War

A. B. Einig, member of Pauley committee, says plants resemble U. S. factories, produce duplicates of American, British and German machine tools. Reparations committee recommending 50% cut in number of Japanese machine tools and tool building plants

CLEVELAND—Less than 10% of Japan's prewar machine tool factories were permanently disabled by war, according to observations of A. B. Einig, general manager of Motch & Merryweather Co. Mr. Einig was industrial machine tool consultant to the Pauley committee, which recently completed a three-month tour of inspection of war-torn enemy countries. Mr. Edwin W. Pauley, head of the American Reparations Mission to Japan is personal representative of President Truman on reparations, and has the rank of ambassador.

Industry Well Operated

Mr. Einig and other members of the 21-man committee were surprised at the good condition of Japanese machine tool plants and at the general excellence of the products the factories turned out. They also were impressed by the ability of the Japs to adapt one machine to a number of different operations (for example, use of large facing lathes in place of vertical boring machines). This was in contrast to the poor housekeeping practiced in most shops, as was evidenced by floors littered with chips and scrap.

In construction and plant layout, the factories ranged right alongside the average machine tool builder's factory in the United States. That is especially true of factories either owned or controlled by one of the zibatsus, or Jap trusts. Through these zibatsus, army and navy officials had a strangle-hold on the nation.

Copy Foreign Tools

Mr. Einig was amazed at the Jap ability to build such exact duplicates of the machine tools manufactured in the United States. He said that one would think upon stepping into a Japanese machine tool plant that he was looking down the assembly line of an American plant. The major difference was the Japanese nameplate on the machines being finished.

None of the Japanese machine tool builders are operating now, except by special permission, and indications are that the industry will never get back to its prewar level. The Far Eastern Commission, representing 11 nations, following the basic report by Pauley Reparations Mission, recommended stripping Japan of about 50% of its machine tools and its machine tool building capacity for distribution to neighboring nations that suffered from their aggression. Last May, the Far Eastern Commission recommended that the portion of Japan's machine tool producing capacity over 27,000 units annually of a balanced type aggregate should be made available for claim.

Tools For Reparations

In addition, it has been recommended that all machine tools in industries constituting war-making potential, including aviation, steel, etc., be removed, leaving only those for peacetime operations. (Only available estimate of the number of machine tools in Japan placed the total around 1,100,000 units, and about half of these will be stripped from Jap plants.) Machinery will be set up by which eastern nations can make application for reparation goods from Japan. There will be no cash reparations.

"For Japan to absorb the production of the prewar Jap machine tool builders is unthinkable," Mr. Einig states. "The Japanese people have never even remotely approached the standard of living as we enjoy in this country. The Japs were never given the opportunity of buying a stove, as we know a stove, or a refrigerator, or any of the other articles of convenience or necessity, even if they could have afforded them. That is why there isn't any metal in the ashes of those burned out sections of Tokyo.

Output Was For War

"The fact is that all metalworking in prewar Japan was carried on with one objective: producing material for the armed forces. With the Japanese workers held in a state of serfdom by the zibatsus and the military and government officials, there was little possibility of the development of civilian markets."

To survey the Japanese machine tool industry, Mr. Einig and other members of the committee had to travel from one end of the country to the other because the industry was scattered. Although a large portion of it was in the Tokyo area, numerous fully equipped, modern factories were located in isolated sections, insuring them from air attack.

Few records were kept by the Japanese of the number of tools produced just before the war, and where they were used. Large numbers were shipped to Manchuria and other areas dominated by the Japs, but the exact number and types cannot be ascertained. Since many Jap-owned tools disappeared from Manchuria during the Russian occupation, there is slight chance of ever getting an exact number of the tools exported.

From Midget Subs to Scrap—Unused midget submarines are being dismantled at the once great Japanese naval base at Kure, in this picture. In the midst of rubble, scrap is being salvaged a year after V-J day for use in transforming the Japanese war machine to peacetime pursuits

In copying foreign makes of tools, the practice had an interesting growth. Since the Jap navy had its origin in British shipyards, Japanese yards were equipped with machines which were adaptations of British tools originally furnished to help the Japs maintain the fleet. Army material was largely made on tools adapted from German machines, since the Japanese army was built and trained under German guidance. But this was not true in plants making autos, trucks, and planes, where fully 25% of the machines were of original U. S. design.

In contrast to the good conditions of machine tool factories in Japan, many plants in Manchuria visited by the Pauley committee were stripped of machines, and oftentimes were entirely destroyed. Shops and factories which were largely untouched are idle because of lack of power due to the removal of huge generators. But even if power were available, widespread repairs would be necessary, since practically all ball and roller bearings have been removed from motors and machines.

By and large, the Japanese machine tools and plants which will be available for reparations are in good condition. There are hundreds of all types of tools available, well designed and of good material. In the Tokyo area alone, there are five plants well stocked with good machine tools, but standing idle today.

ASM Medal To Zimmerman

CLEVELAND—Dr. Rufus E. Zimmerman, vice president in charge of research and technology of the United States Steel Corp. of Delaware, has been elected to receive the American Society for Metals' award for the Advancement of Research for 1946.

The medal will be awarded, along with a plaque and citation, at the annual banquet of the society, which is to be held in Atlantic City, N. J., on November 21 during the National Metal Show.

Truck Bookings Fluctuate

CHICAGO — Domestic bookings of electric industrial trucks in May were 28% over those of April, according to the latest figures released by the Electric Industrial Truck Association. Total bookings in May totalled 315 units with a net value of $1,389,870 which was $303,325 over April's bookings of 257 units, valued at $1,086,545. The latter was a slight decrease from the $1,151,009 booked in March.

Also, cancellations totalling $323,073 in April were considerably more than May's low figure of $69,585.

Kaiser Blames Competitors for Steel, Shipyard Difficulties

SAN FRANCISCO — Henry J. Kaiser's press battle with his critics and the steel industry is regarded here as an attempt to solicit sympathy for the refinancing of Fontana. When critics asked that his financial empire be investigated, Kaiser retorted that he would welcome such an investigation since it would reveal the opposition of the steel industry and the Defense Plant Corporation to his plans to build the Fontana steel mill. Kaiser claims that the DPC attitude forced him to resort to the RFC loan which now hangs heavily over the Fontana operation.

The Fontana mill is now hovering between the red and black ink, but a 50-cents-on-the-dollar deal for the mill would give Kaiser a workable deal. He says he's being discriminated against because the U. S. Steel Corp. only paid 23-cents-on-the-dollar for Geneva. He also asks a lower freight rate on coal from Utah if Geneva is given a lower rate for unfinished steel to west cost ports.

Bus Plans Hampered

Kaiser is also battling over continuing operations at his Richmond shipyard number 3, since the Maritime Commission has asked him not to contract work for repair and conversion that could not be completed by September 30th. The Commission says that it intends to start ship scrapping operations in the yards. Again, Kaiser claims pressure from his competitors, in this case charging that Todd and Bethlehem used pressure to get the Maritime Commission to act against Kaiser. Mr. Kaiser wants an investigation of this step. The City of Richmond is backing Kaiser, because it is anxious to maintain the yards in operation to sustain its employment. City officials want the Commission to do something with the other three shipyards, formerly operated by Kaiser, and now idle as surplus.

Kaiser had planned to use the Richmond shipyard facilities to build new two-section busses made of aluminum and magnesium, and says he already has spent $50,000 on reconversion costs. Kaiser claims to have turned down $35,000,000 worth of business, because of uncertainty over having a place to make the busses.

Benjamin Reel Co. Formed

CLEVELAND—The Benjamin Reel Co. has been formed here to manufacture a reel designed to take in and pay out electrical cord on household appliances. Organized by David Benjamin, former director of The Gabriel Co. and prior to that president of Pressure Casting Co., the new firm has purchased the plant, machinery and equipment of Meters & Pumps, at 10700 Broadway, Cleveland. The plant has 16,500 sq. ft. of space and is situated on five acres of land.

Actively associated with Mr. Benjamin will be Mr. Charles R. Yirava as factory manager and Mr. J. Elwood Johnson as chief engineer. Mr. Yirava was previously in charge of Meters & Pumps, Inc., while Mr. Johnson was associated with Warner & Swasey Co., in an engineering and development capacity.

Supersonic Possibilities—This tailless single-seater plane developed by the British, is expected to fly faster than the speed of sound at sea level. Air resistance is lowered by the use of wings sweeping back at a 43 deg. angle. Made by the deHaviland Aircraft Co., it is actually a stripped down version of the Vampire jet fighter, and has been designed to explore the problem of controlling high-speed planes with backswept wings

Labor Uncertain of Means for Getting Higher Pay Without Increased Prices

NEW YORK—There is no place in immediate labor strategy for a new series of major strikes to support demands for another general wage increase, but no one—and most of all no union leaders cautioning against strikes—will predict that industry can plan ahead into 1947 with assurance that there will be no crippling work stoppages.

Wage gains made early this year, which generally followed an 18½¢-an-hour pattern, have been wiped out by increases in the cost of living. Workers who celebrated their raises in the spring are restive now because, they complain, the increased pay checks do not spread even as far over day-to-day expenses as those they took home before the 1945-46 wage siege. Except for food, most price increases were due to higher wage costs.

Wages Vs. Living Costs

To rank-and-file workers that means another pay boost is due. But there is tacit recognition among top labor leadership, both CIO and AFL, that another round of wage increases now would mean another lifting of living costs. The whole purpose of the raise would be defeated. There still would not be more pork chops in the grocery basket.

Down the line in labor unions has gone a strong admonition that the current objective must not be more dollars-and-cents pay, but more purchasing power for the base rate which now appears on wage slips.

Unfortunately, neither AFL or CIO has had notable success in doing more than to delay rank-and-file pressure for new wage demands, and strikes to back them up if necessary. Packinghouse workers of both unions currently are negotiating with major meat packing companies—and while, so far, the wage issue has been soft-pedalled for guaranteed wage and other so-called "fringe" demands, union meatpackers make clear they are thinking in terms of more money, and more pork chops.

Hopeful On Wages

CIO oil workers, whose strike in 1945 started the first postwar wage increase drive, have set up a wage committee to formulate, and submit, new demands. Chrysler Motors has received from its United Auto Workears local, a notice that the UAW negotiators will present new wage demands in October. The big Dearborn, Mich., Ford UAW organization is studying ways to reopen its contract. AFL's teamsters and bakers are asking more money, and CIO's rubber workers are ready to act against the Akron Big Four employers.

Actually, however, real wage pressure is not expected to be applied in any of these situations before mid-October. What the unions will ask then—and efforts will be made to have the demand uniform for all CIO—will depend, as UAW's executive board announced, on "a careful evaluation of the relation between prices and wages" at the end of a 60-day period.

Price Cuts Dubious

Thus whatever wage increase is asked will be based on the degree of success government and industry have in rolling back prices to June 30 levels (the prices in effect before the 30-day hiatus of the economic stabilization act) and in holding them there.

How the National Wage Stabilization Board will fit into the next wage struggle is a question NWSB itself would like to have answered. Recently, against NWSB's will, Economic Stabilization Director John R. Steelman rejected a 3½¢ hourly wage boost for Pacific Northwest lumbermen. The move was widely interpreted as a bar against any second round of wage increases. Although NWSB subsequently sought to deny that this was a hard-and-fast policy, there was no doubt that any request for pricing relief based on a second postwar pay boost would undergo the most critical scrutiny, and unless "special circumstances" could be proved the requests would have a slim chance at approval.

This is significant because no one sees any chance for a rollback to June 30 price figures. Hence, while the current automatically approvable wage raise is pegged at an aggregate 33% increase since January 1941 (amount living costs were estimated to have risen between then and February 14 of this year) living costs computed on the same basis will actually be points higher.

New Formula Likely

If, say, costs were up 40% after rollbacks, what would government do about its 33% yardstick? The simple solution, to lift the 33% to the higher 40% as an allowable figure for increases, would invite a demand for the reopening of thousands of contracts, could engender problems and controversies which would split NWSB wide open. But to ignore the increased costs might do exactly the same thing. As far as AFL is concerned, quick demise of NWSB would be welcome. CIO is more reluctant to see government move out of the wage arena.

Hence, CIO is talking a lot about something new in the now familiar "fringe" pattern — a cost-of-living bonus to be paid at regular intervals to offset any drop in purchasing power that might have occurred. As a flexible bonus, it would have the advantage of leaving wage rates unchanged, and yet assuring the earner of a stabilized purchasing power.

Steel Industry Threatened Again—With a direct steel strike and a coal strike behind it, the steel industry anxiously watches current strikes, including the Great Lakes Seamen's strike which is hampering the shipment of iron ore. Since the strike was only partially effective, the ore movement has not been hampered much. Police are here shown breaking up massed picketing by CIO unioneers

Names in the News

Warren H. Farr

Warren H. Farr, vice president of the former Budd Wheel Co., Philadelphia, Pa., has been appointed vice president in charge of manufacturing of the Budd Co., which was recently formed as a result of a merger between the Budd Wheel Co. and the Edward G. Budd Co. Prior to joining Budd in 1927, Mr. Farr was works manager for the Flint Motor Co.

Marlin C. Nelson, formerly engineer in charge of Ellinwood Industries' Los Angeles experimental research division, has been named works manager of the company and **Le Roy Barrett** has been made manager of the farm equipment division.

Arthur C. Wilby has been elected vice president of the United States Steel Corp. of Del. Mr. Wilby, who has been associated with U. S. Steel for 37 years, will maintain headquarters in Chicago.

James E. Allen has been elected executive vice president of The Aro Equipment Corp., Bryan, Ohio.

Robert D. Oldfield, sales manager since 1923, has been elected president of the Western Automatic Machine Screw Co., Elyria, Ohio, succeeding **B. C. Franklin,** who retired after 36 years with the firm.

August A. Bolik has resigned after 20 years as district manager of the Dayton and Cincinnati sales offices of E. W. Bliss Co. to become associated with Henry F. Smith & Son, Cincinnati, in charge of its Dayton office.

D. E. McGuire, assistant to the general works manager for Great Lakes Steel Corp., Detroit, has been appointed chief engineer.

William R. Thompson and **Edward G. Cressell** have been appointed district managers for Geary Stainless Steel Co., Baltimore. Mr. Thompson, manager in western Pa., is located at 75 Lemoyne Ave., Washington, Pa., while Mr. Cressell, who is heading the southwestern Mich. territory, is at 333 N. Michigan Ave., Chicago.

Michel Biscayart has been appointed regional manager of the Foreign Div., Norton Co., Worcester, Mass. His territory will include the Netherlands, Belgium, Switzerland, Portugal and Spain and he will make his headquarters in France.

Alexander B. Andrews, Jr. is the new Kropp Forge Co. engineering representative in No. and So. Carolina. His office is in the Insurance Bldg., Raleigh, N. C.

Kenneth F. Thomas has been appointed district engineer for the New England office of the Kaydon Engineering Corp., Muskegon, Mich. His address is 62 LaSalle Rd., West Hartford, Conn.

K. P. Swanson has been named to represent Progressive Welder Co., Detroit, in eastern Conn., eastern Mass., R. I., Me., Vt. and N. H. He will maintain offices at 15 Gramercy Park, New York City.

David C. Crowley has been appointed Texas representative for Colonial Broach Co. and Colonial Bushings, Inc. with offices at 531 Esperson Bldg., Houston.

Harold Nutt, formerly director of engineering of the Borg & Beck Div., Borg-Warner Corp., Chicago, has been elected vice president in charge of engineering.

J. L. Onderdonk, who has been associated with ACF since 1912, has been appointed an assistant vice president of American Car & Foundry Co. with headquarters at the ACF Chicago sales office.

A. L. Thurman

James Riddell

Astor L. Thurman has been appointed assistant to the vice president of The Aetna-Standard Engineering Co. He joined Aetna-Standard last December after eight and one-half years with General Electric Co., Schenectady, N. Y. He is being succeeded as chief electrical engineer by **James Riddell** who has been with the company's engineering department for eight years.

Arthur I. Schell has been appointed general manager of the Hope Machine Co., Philadelphia, Pa.

John O. Forster has been appointed chief engineer of Aircraft Screw Products Co., Inc.

Douglas L. Darnell, sales manager since 1936, has been elected vice president in charge of sales of the Baker-Raulang Co., Cleveland.

Detroit Broach Co. has named the following new sales representatives: **Ernest A. Isberg,** 1608 Commercial Trust Bldg., Philadelphia, Pa. for the middle atlantic states; **Sam H. Penny,** Box 1271, Houston, Texas in southern Texas, and **Henry E. Roedter,** serving southern Ohio and Ky., is at 1623 Carew Tower, Cincinnati. Also, **James Webb,** formerly assistant chief engineer, is now sales engineer for the firm.

BUSINESS ITEMS

W. H. Marsh

Rockwell Manufacturing Co., Pittsburgh, Pa., has established an hydraulics division to specialize in the development of hydraulic equipment. **W. H. Marsh,** who joined the Rockwell organization in 1934, will be the general manager of the division. The division is an outgrowth of the gun pointing program, directed by Mr. Marsh during the war.

TOCCO Div., Ohio Crankshaft Co., Cleveland, has reorganized its Induction Heating Div. and formed a **Commercial Engineering Dept. Harry L. Keller** has joined TOCCO to head the department and **Harry B. Osborn, Jr.** will serve as sales manager, while **John T. Vaughn** will be research and development engineer.

Prescott Brass Manufacturing Co., Ltd. has started operations in Prescott, Ont. **Oscar Federer,** formerly general manager of the Vitkovic plant in Czechoslovakia, is president of the firm.

Barnes & Reinecke, Inc., Chicago, have purchased the **Shoberg Tool Co.,** manufacturers of precision tools, instruments and machines. **Fred P. Shoberg,** founder of the company, will continue as president of the tool company, which will be a division of Barnes & Reinecke.

Lisk Manufacturing Co. has moved its general office from Canandaigua, N. Y. to Buffalo, N. Y. The factory and factory-office will remain in Canandaigua.

H. K. Porter Co., Inc., Pittsburgh, Pa., has acquired the **Brake Equipment & Supply Co.**, Chicago.

The Commercial Iron Works, Portland, Ore., 30 year old shipbuilding firm, is in the process of being liquidated.

Taco Engineering Co., 2620 So. Park Ave., Chicago, has been formed by Theodore A. Cohen as a consulting, designing, and manufacturing organization.

The Autry-Okon Foundry Co., Inc., has been organized with **Alexander C. Okon** as president and **Leonard D. Autry** as vice president. The firm will operate in the former Bell Bomber plant at Marietta, Ga., where they will manufacture a complete line of cooking utensils and do general foundry work with brass, aluminum and cast iron.

The Standard Aircraft Products, Inc., and the **S. H. Thompson Manufacturing Co.,** Dayton, Ohio, have merged into the **Standard-Thompson Corp.,** with offices at 121 Franklin St.

The Lake Erie Engineering Corp., Buffalo, N. Y., has taken over the **Feller Engineering Co.,** Pittsburgh, designing and engineering firm.

General Electric Co's. Chemical Dept. has been further expanded to include a metallurgy division with headquarters in Pittsfield, Mass.

The Lindsay Corp. has moved its offices and plant to its new building at 1740 25th Ave., Melrose Park, Ill.

Ace Tool & Die Co., 71-75 Edward St., Buffalo, N. Y., has been formed by **Alen F. Burley** and **Frances C. Spencer.**

Frontier Plating Co., 65 Auburn Ave., Buffalo, N. Y., has been established with **Charles E. Fadale** and **Peter J. Mancuso** as partners.

OBITUARIES

Charles H. McCrea, 56, president of National Malleable & Steel Casting Co., Cleveland, died August 24. Mr. McCrea joined the firm in 1912 as a special engineer and since then has served the company in many capacities.

Edward P. Welles, chairman of the board of Charles H. Besly & Co., Chicago, died recently. He became general manager in 1898, president in 1909 and four years ago he was named chairman.

Stanley Motch

Stanley Motch, 69, passed away at his home in Cleveland, August 20. He was co-founder, with his brother Edwin R. Motch and the late George E. Merryweather, of the Motch & Merryweather Machine Co. He served from the firm's inception in 1904 until his death as vice president and treasurer. He was widely known among machinery dealers.

Elbert M. Kimble, 60, gear engineer at the Eaton Mfg. Co., Cleveland, died suddenly August 14. Mr. Kimble, who was considered an authority on the manufacture of automotive gears, had been associated with Eaton for 18 years.

Edward S. Gram, 72, vice president and general manager of the Crosby Co., Buffalo, N. Y., for 40 years until his retirement seven years ago, died August 9.

Frank Tralles, 91, former president and one of the founders of the Buffalo Manufacturing Co., Buffalo, N. Y., passed away August 17. Mr. Tralles became president of the firm when it was started in 1900 and retained his position until his retirement in 1930.

Alexander Lowenstein, sole owner of the metal spinning firm in Binghamton, N. Y., bearing his name, died following a heart attack August 15.

Emil N. Tolkacz, 86, founder and president of the Missouri Boiler and Sheet Iron Works died August 14.

Joseph F. Madia, 70, part owner and manager of Seneca Foundry, Geneva, N. Y., passed away August 12.

MEETINGS

American Gear Manufacturers Association. Semi-annual meeting. Edgewater Beach Hotel, Chicago, Ill. Oct. 28-30. Newbold C. Goin, executive secretary, Empire Bldg., Pittsburgh 22, Pa.

American Machine Tool Distributors' Association. Fall meeting. The Homestead, Hot Springs, Va. Sept. 18-19. Annual meeting. Hotel Statler, Cleveland, Ohio. Nov. 19-20. Thomas A. Fernley, Jr., executive secretary, 505 Arch St., Philadelphia 6, Pa.

American Management Association. Production meeting. Palmer House. Chicago, Ill. Nov. 14-15. American Management Association, 330 W. 42 St., New York 18, N. Y.

American Society for Metals. Municipal Auditorium, Atlantic City, N. J. Nov. 18-22. Graves Taylor, 7301 Euclid Ave., Cleveland 3, Ohio.

American Society of Body Engineers. Technical Convention. Rackham Memorial Bldg., Detroit, Mich. Oct. 23-25. Carl W. Cenzer, chairman, 100 Farnsworth Ave., Detroit, Mich.

American Society of Mechanical Engineers. Fall meeting. Hotel Statler, Boston, Mass. Sept. 30-Oct. 3. Ernest Hartford, assistant secretary, 29 W. 39 St., New York, N. Y.

American Society of Tool Engineers. Semi-annual meeting. Hotel William Penn, Pittsburgh, Pa. Oct. 10-12. J. M. Cannon, director of public relations, 1666 Penobscot Bldg., Detroit, Mich.

American Welding Society. Annual meeting. Atlantic City, N. J. Nov. 17-22. American Welding Society, 33 W. 39th St., New York 18, N. Y.

Instrument Society of America. National instrument conference and exhibit. William Penn Hotel, Pittsburgh, Pa. Sept. 16-20. Richard Rimbach, executive secretary, 1117 Wolfendale Ave., Pittsburgh 12, Pa.

Magnesium Association. Annual meeting and exhibit. Waldorf-Astoria Hotel, New York, N. Y. Oct. 3-4. T. W. Atkins, executive secretary, 30 Rockefeller Plaza, New York, N. Y.

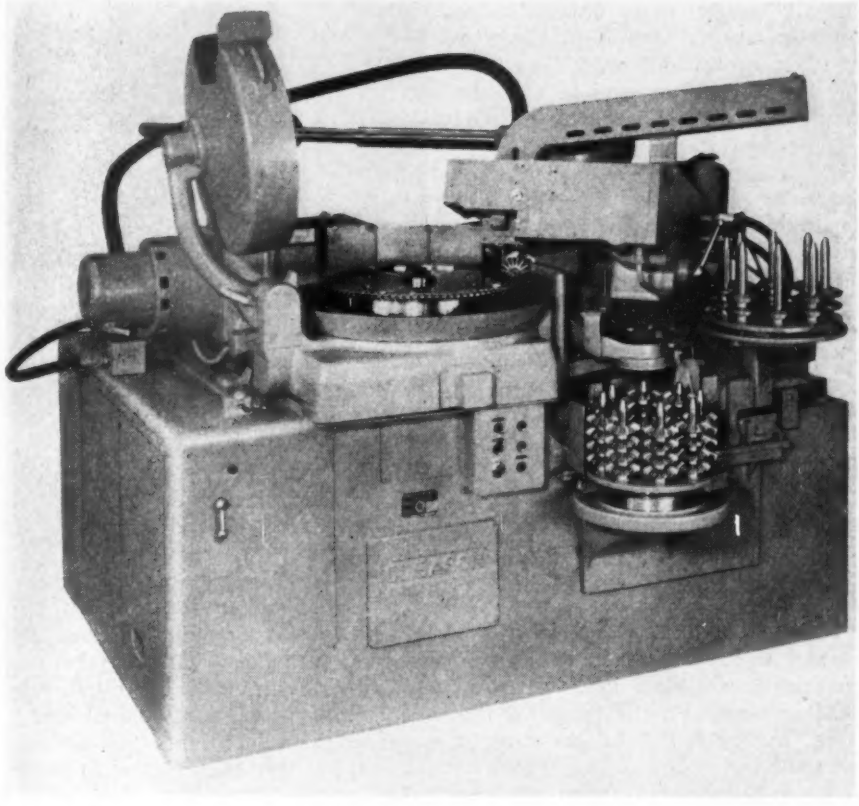
National Electronics Conference. Edgewater Beach Hotel, Chicago, Ill. Oct. 3-5. C. A. Emery, chairman publicity committee, 20 No. Wacker Dr., Chicago 6, Ill.

National Metal Congress and Exposition. Municipal Auditorium, Atlantic City, N. J. Nov. 18-22. W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

National Tool & Die Manufacturers Association. Annual meeting. Congress Hotel, Chicago, Ill. Oct. 23-26. George S. Eaton, executive secretary, 1412 Union Commerce Bldg., Cleveland 14, Ohio.

Shop Equipment News

Gleason Revacycle Gear Generator Cuts Tooth in One Turn of Cutter



One revolution of the large horizontal cutting disk cuts one tooth from the solid blank in this No. 8 Revacycle machine. Work is automatically loaded

A machine for cutting straight bevel gears with conjugate tooth surfaces, No. 8 Revacycle, has been developed by Gleason Works, 1000 University Ave., Rochester 3, N. Y. The machine, said to be the fastest developed for this purpose, is intended for quantity production.

The Revacycle process is a method completely generating straight bevel gear teeth in one cut from the solid metal. A large diameter, disk-type cutter is used. Each blade is relief ground so that it cuts the same shape after sharpening, which is done by grinding the front face.

The cutter is mounted to rotate in a horizontal plane and turns continuously at a uniform rate. The blank is held motionless while the cutter is moved by means of a cam in a straight line across the face of the gear or pinion and substantially parallel to its root line. This makes possible the production of the straight tooth bottom. The desired tooth shape is produced by the combined effect of the motion of the cutter and the design of the cutter blades. The cutter contains roughing, semi-finishing, and finishing blades. One revolution of the cutter completes each tooth space. There is a gap in the cutter in which the blank is indexed for the next tooth.

Blade cutting at either end of the tooth space are made slightly wider than necessary for correct taper, in order to ease off the ends of the tooth and produce localized tooth bearing. Gears cut in this machine are not interchangeable with gears generated on the two-tool generators.

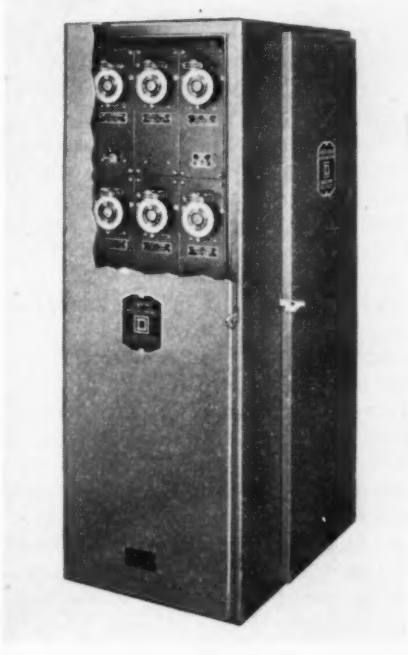
An automatic loading device is available for handling high-production, automotive differential gears.

Square D Welding Control Unit Combines Controls in One Case

Automatic control of air-operated resistance welding machines is provided in the Class 8992 combination control unit made by the Square D Co., 4041 N. Richards St., Milwaukee, Wis. The unit is designed to meet recently adopted NEMA standards for resistance welder control.

A Syncro-Break welder contactor and Safront sequence-weld timer are included in a single inclosure. Large calibrated dials on the front of the unit make for easy setting of the timing period.

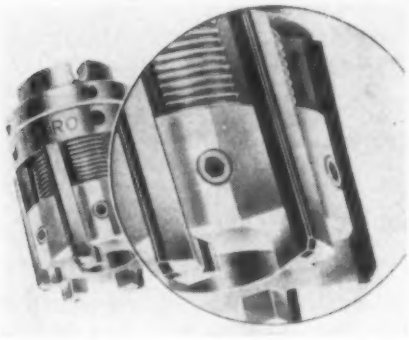
Only four mounting holes need be drilled in the machine. Conduits and fittings are minimized. Foot switch, pressure switch, no-weld switch and timer control circuits operate at 110 volts and are isolated from the power supply for added safety. The control circuits may be either separate or common with the



power circuits for the machine.

Unified construction in a neat, modern inclosure makes unnecessary unsightly exterior control wires.

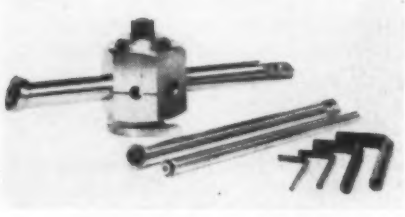
Metro Expanding Reamers Have Low Expansion Angle



1- to 6-in. heavy-duty solid shank and shell-type expanding reamers with H.S.S. or carbide cutting edges are announced by Metro Tool and Gage Co., 4240 W. Peterson Ave., Chicago.

The reamers are said to be designed with a low expansion angle to lessen the O.D. grinding when resharpening. A 1/16-in. blade overhang increases rigidity without loss of chip clearance.

Shearcutter Circular Cutter Used on Boring, Turning Tool



A Shearcutter boring, turning, and facing tool with a circular cutter bit is announced by Fearless Tool Co., 1234 S. Gramercy Place, Los Angeles 6, Calif. New cutting edges may be presented to the work by rotating the bit. Penetration angle of the tool is said to be such that a shearing action is attained.

The circular bit is resharpened in one minute. The tools are marketed with three bit holders, fixed bits, and a precision tool holder.

Correction: In the last line, second paragraph, of the description of the Bullard Man-Au-Trol Spacer, in the preceding *Shop Equipment News* section, a misspelled word ("not" instead of "now") inverts meaning. This should read ". . . special tools costing about $500,000 to make will *now* become scrap at that plant."

American Tool Duplicating Lathe Has a Single Hydraulic Control

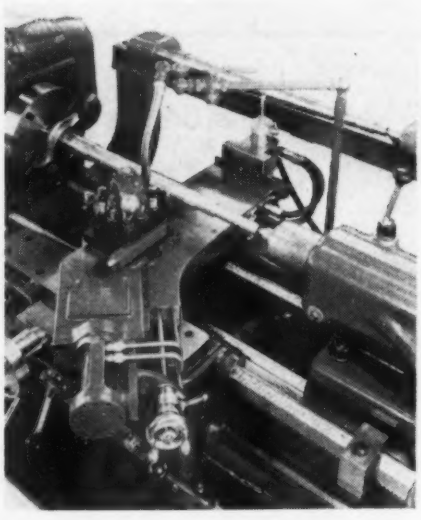
A new hydraulic duplicating lathe which is a combination of the Pacemaker lathe and a special built-in Turchan hydraulic duplicator, is announced by the American Tool Works Co., Cincinnati 2, Ohio. The lathe will reproduce from a templet mounted at the rear of the lathe any shaft having an irregular contour including steps, tapers, right angle or tapered shoulders, recesses, grinding necks, and radii. The templet may be either a piece of sheet metal or an original of the shaft to be reproduced.

The machine is said to produce duplicate work at low cost. It reproduces contours with accuracy at the speeds and feeds recommended for cemented-carbide tools.

The toolslide operates at a 45° angle to the work axis which compensates for the longitudinal movement of the carriage and permits reproduction of square shoulders as well as radii and bevels. Without this compensating factor, square shoulders could not be reproduced with the single hydraulic control of the toolslide without stopping the longitudinal feed of the carriage.

The lathe can be used as a standard engine lathe by removing the templet and with the control lever locating the toolslide in its full forward position. It is held against the thrust by the hydraulic pressure in the cylinder.

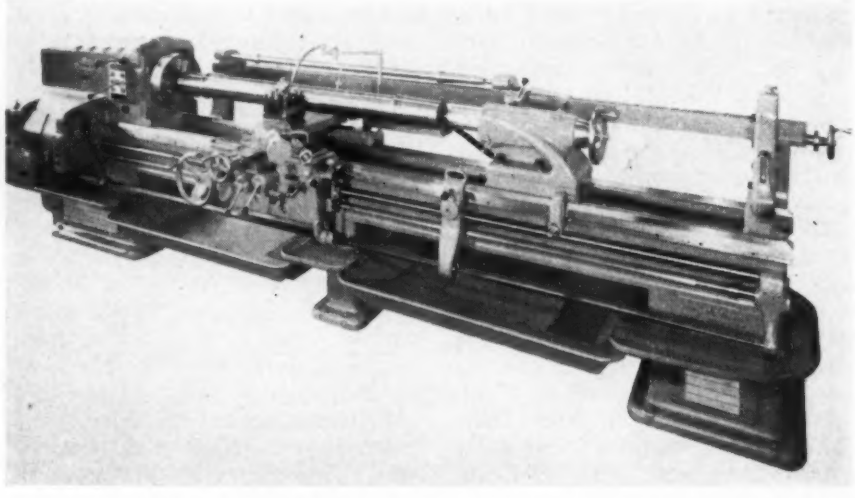
The hydraulic equipment consists of a motor-driven hydraulic pump which supplies the hydraulic pressure, a hydraulic tracer valve which meters the oil directly to the piston which controls the movement of the toolslide. A small handwheel permits positioning of the tracer valve to establish the relation between the tracer point and cutting tool for varying the depth of cuts. A lever is provided for quick advance and return of the toolslides.



The tool slide is operated by a single hydraulic control and is set at 45° to the work axis to compensate for the longitudinal movement of the carriage when following square shoulders

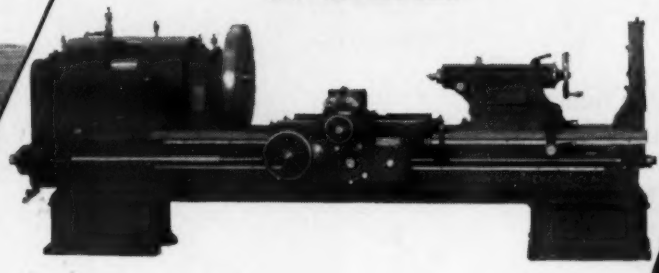
Established maximum turning capacity for the 16-in. lathe is 4 in. and for the 20-in. lathe it is 8 in.

The templet support bar is adjustable lengthwise by means of a hand-

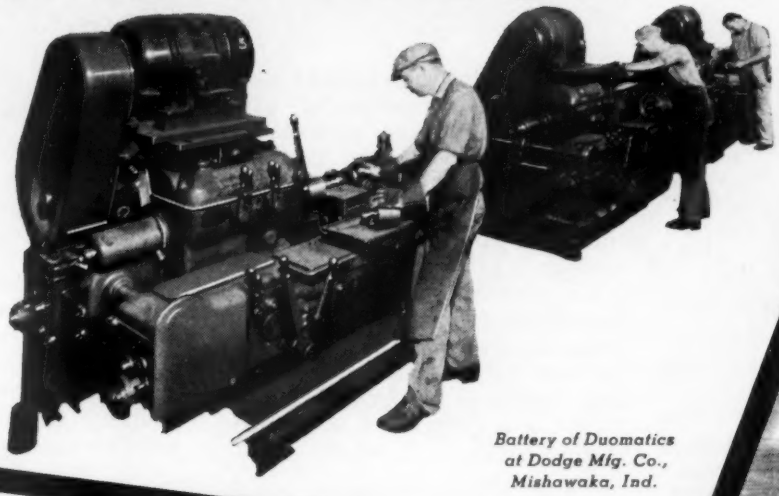


The piston rod being machined in this setup weighs over 800 lb. As it is too heavy to use as a templet, a reduced diameter templet is being used

THIS LATHE WAS A PROFIT MAKER IN *1912*



BUT WHAT ABOUT *1946*?



Battery of Duomatics at Dodge Mfg. Co., Mishawaka, Ind.

DO IT WITH A *DUOMATIC*

● Industry and machine tools have come a long way since the day of the "walrus" mustache. Labor, material costs and other overhead have multiplied many times.

Modern Lodge & Shipley Lathes compensate for these rising costs . . . produce many times yesteryear's snail-pace production. But even lathes just a few years old may be out-of-date measured by today's highly competitive conditions. The true and only standard is profitable production!

Consider the new Lodge & Shipley 2A and 3A Duomatic Lathes. Fully automatic, even on complex, multiple tool jobs, Duomatics step-up production—drastically lower costs. One operator with a Duomatic easily equals the production of several older lathes.

The Duomatic is like a lathe with a "man inside". The unskilled operator merely loads the workpieces, starts the cycle, then unloads when finished. Because there are no cams, cycle changing is vastly speeded and simplified. These and many other features transfer responsibility from operator to machine.

Why not investigate the profit possibilities of Lodge & Shipley Duomatic Lathes? L & S Engineers will be glad to explain these features—demonstrate them on your own work. Write on your company letterhead for Bulletins 601 and 620.

ENGINE
TOOL ROOM
MANUFACTURING
OIL COUNTRY
DUOMATIC (AUTOMATIC) LATHES

THE LODGE & SHIPLEY MACHINE TOOL CO.

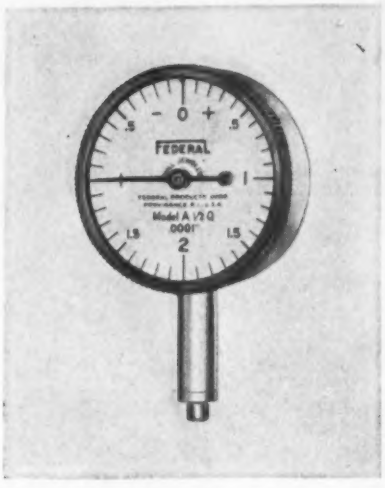
L & S LATHES

CINCINNATI 25, OHIO, U. S. A.

MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

wheel at its right-hand end. This compensates for the variation in permits alignment of the templet center-hole depth in the work and with the work when setting up the machine.

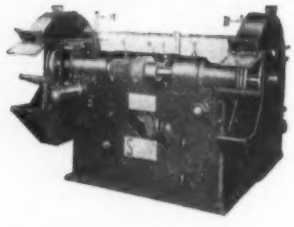
Federal A-Size Indicators Are Used in Cramped Space



Three new "A" size dial indicators are announced by Federal Products Corp., 1144 Eddy St., Providence, R. I. The over-all bezel diameter of these models is 1¼ in. The illustration shows a gage in actual size.

The small gages are for use when design is such that there is not space for a large indicator, or where the gage is portable and weight is a factor. The indicators are Model A ½ Q, which is graduated 0.0001 in., Model A3Q graduated 0.0005 in., and Model A6Q-2 graduated 0.001 in.

Standard Electrical Grinder Handles 18- to 30-in Wheels



The No. 30 multiple-speed snagging grinder made by the Standard Electrical Tool Co., 2480 W. Sixth St., Cincinnati 4, Ohio, has been redesigned to handle wheels from 18 to 30 in.

Three spindle speeds are provided to maintain grinding efficiency as the wheels reduce in diameter. The adjustable sheave on the spindle is accessible through a hinged cover.

Glenn Martin Gage Uses Vacuum To Measure Sheet Thickness

A new type instrument gage which measures the thickness of metal sheets by the pressure principle has been developed by the Glenn L. Martin Co., Baltimore 3, Md. It can also be used for inspection of the bonds between the layers of laminated materials.

The gage consists of an inverted cup-shaped shell with a top wall of transparent material and the bottom rimmed with a rubber gasket. A dial indicator mounted inside the shell has a spherically shaped foot resting against the metal surface being checked.

Readings are made on the dial indicator with normal pressure inside the cup and with the air evacuated from the cup. The vacuum causes a deflection of the sheet which is recorded by the indicator.

The instrument may be calculated for the materials inspected, so that for a particular laminated material a deflection of a certain amount indicates faulty bond in a particular layer. It can also be calibrated to inspect the thickness of a single sheet. This is useful for large sheets where measuring central areas would be impossible with micrometers.

Standard-Hampton Speed Chuck Operated with Spindle Turning

An inexpensive high-speed chuck, intended to increase production and lower cost on short-run operations, has been developed by the Standard Tool and Gage Co., a subsidiary of the Jack & Heintz Precision Industries, Inc., Cleveland 1, Ohio.

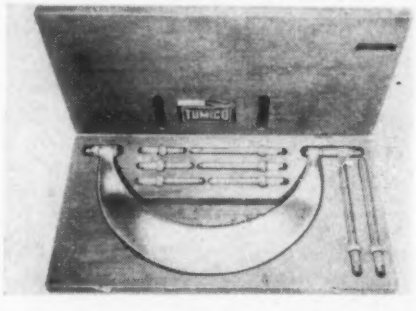
The Standard-Hampton Speed Chuck can be opened and closed by a slight movement of the handle without stopping the motor or spindle. If stopping the spindle is desired, the handle can be used as a brake. The chuck is said to compensate for spindle run-out and to allow close tolerance chucking on any type lathe, in most instances.

The jaws can be adjusted for close-tolerance concentric or eccentric turning operations, and will hold any size or shape of bar stock within minimum or maximum range.

Tubular Micrometer Is Used Without Removing Boring Bar

Bores can be measured without removing boring bars with the tubular over-the-bar inside micrometer made by Tubular Micrometer Co., St. James, Minn. The micrometer has a hollow-box-type steel frame which is rigid and light.

The frames are hydrogen brazed and plated with copper, nickel, and heavy chrome to resist wear and perspiration. Standard range of sizes is from 8 to 28 in. and will cover bar diameters from 4 to 8 in.



Over One Million feet of precision threads with just six cutters!

Part: Large adaptor plug.
Material: SAE 1035.
Thread Diam.: 4" and 6⅜" on each piece.
No. of Threads: 8 and 10 respectively. (12 pitch)
Tolerance: ± 0.005 in. (on pitch diameter)
Quantity: 50,000 pieces.
Output: 15 parts per hr. per machine. (16 hrs/day)
Tools Required for Run: Only 6 "Detroit" thread milling cutters.
Average No. of Grinds: 18 per Cutter.
Stock Removed per Grind: .015 to .020 in.

Those are cold figures but to the tool engineer and production man they tell a real cost-saving story—the kind of performance needed today to keep costs down—the kind of performance "Detroit" thread milling cutters are giving day in and day out.

Those "Detroit" cutters were just as good as new even after 18 sharpenings apiece.

What's more, "Detroit" thread milling cutters are easy to order. Most widely used types and sizes are even carried in stock, ready for thread grinding to your specs.

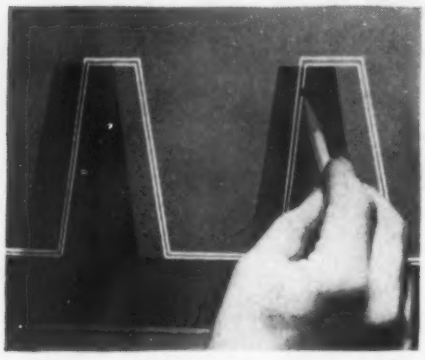
Ask for Bulletin No. CB-45

• Ground Taps • Tap Reconditioners •

DETROIT
TAP & TOOL CO.
8432 BUTLER AVE. • DETROIT 11, U.S.A.

• Thread Gages and Special Threading Tools, Machines and Checkers •

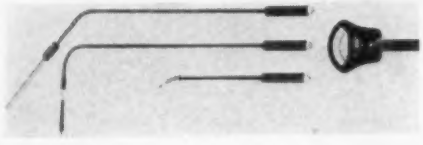
Kodak Scribing Plates Used With Optical Comparators



A material known as Kodak Green Scribing Plate, for use with optical comparators of the contour projection type, is announced by Eastman Kodak Co., Rochester 4, N. Y. The plates may be used directly with the contour comparators or as printing masters for photographically duplicating the contour comparator plate.

A transparent green-dyed gelatin coating is applied to glass, and tolerance lines are scribed on the plate by cutting through the gelatin film. Etched glass plate can be eliminated, and the entire execution of comparator plates left in the hands of a skilled draftsman. Tolerance limits in shadowed areas are brought into sharp relief, showing a red line against the dark green background. When precision grinders are equipped with contour comparators, this permits the machine operators to see exactly how much material must be cut away to attain the desired dimensions.

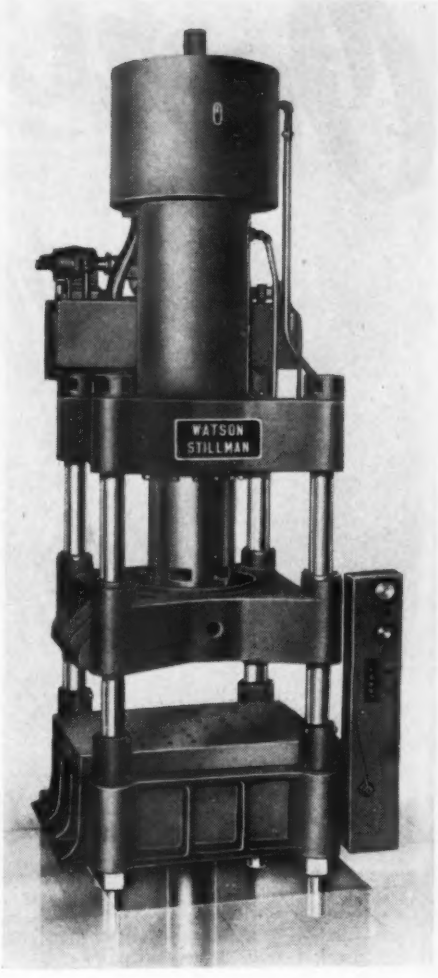
Wheelco Portable Pyrometer Has Choice of Extensions



An extension-type portable pyrometer for use where a universal instrument is required is announced by Wheelco Instruments Co., 847 W. Harrison St., Chicago, Ill. A choice of plug-in angle extensions is available for situations requiring different kinds of thermocouples.

The extensions are available in either straight, 45 or 90° angle types. Adapters permit the choice of material and calibration of thermocouples. The pyrometer is contained in a sealed, dustproof aluminum case with a pistol grip handle.

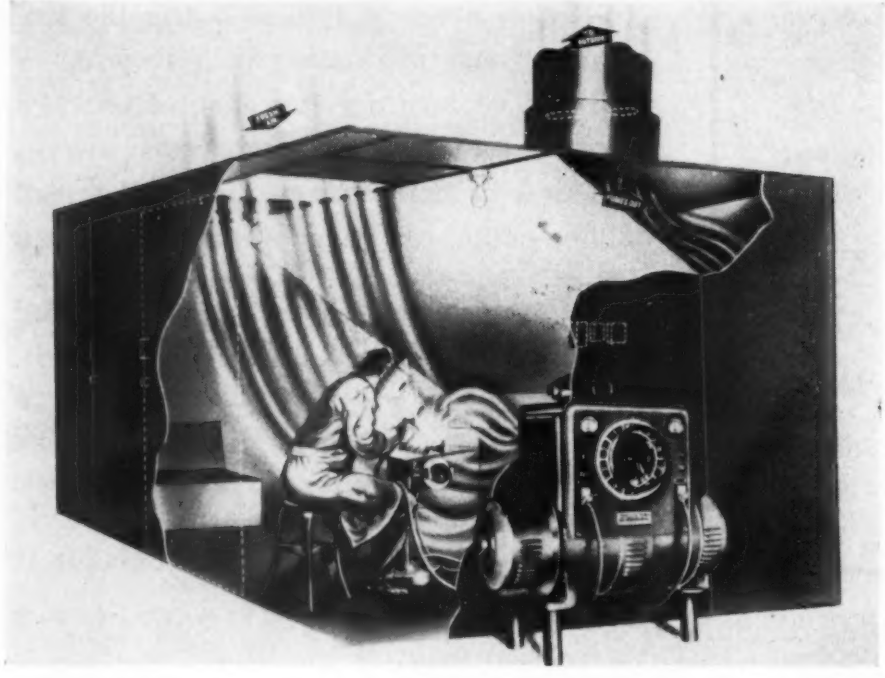
Watson-Stillman Forming Press Equipped with Oversize Cushion



An oversize die cushion is the feature of a 500-ton forming press introduced by Watson-Stillman Co., Roselle, N. J. The cushion has surface dimensions of 3 ft. 4 in., by 3 ft. 4 in. and adapts the press to larger and more varied loads than were previously allowable with standard construction. Controls are centralized on a panel board which can be placed at the machine or at one side.

Working pressure of the press is 2,000 psi. The machine is controlled by simplified operating features, with pressure controlled by a single knob. Press control is accomplished by a single lever on manual operation, with a pushbutton for single-cycle automatic operation. Press reversal is pressure-controlled.

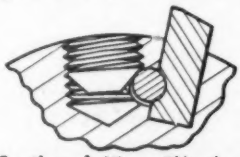
The press advances and returns at a speed of 300 ipm. Speeds in compression are 30 ipm. for pressures up to 250 tons and 8 ipm., above 250 tons.



WELDING BOOTH—Better working conditions for production welders are the purpose of this welding booth designed by Hobart Bros. Co., Troy, Ohio. Constructed of fabricated panels, it can be disassembled to move to a new location. Fresh air is drawn in at the top of the booth and expelled on the outside of the building, providing fresh air for the operator, and protecting fellow workers from eyeburn and welding fumes

Cut Costs On and Off the Job

Positioning of McCrosky's service proved pin and screw locking device in front of the blade, enables the screw lock to work with, rather than against the cutting thrust,—thus holding the blade securely in the slot, even when in fully extended position,—and without restricting the clearance for chips and lubricant.



Sectional View Showing Bearing Screw and Pin That Hold the Blade Rigidly Against the Reamer Body.

Blades can be released easily, and adjusted uniformly and accurately. This permits them to be reground with a minimum loss of stock, and the reamer returned promptly to service, reducing to a minimum the number of tools required to keep a job in continuous production.

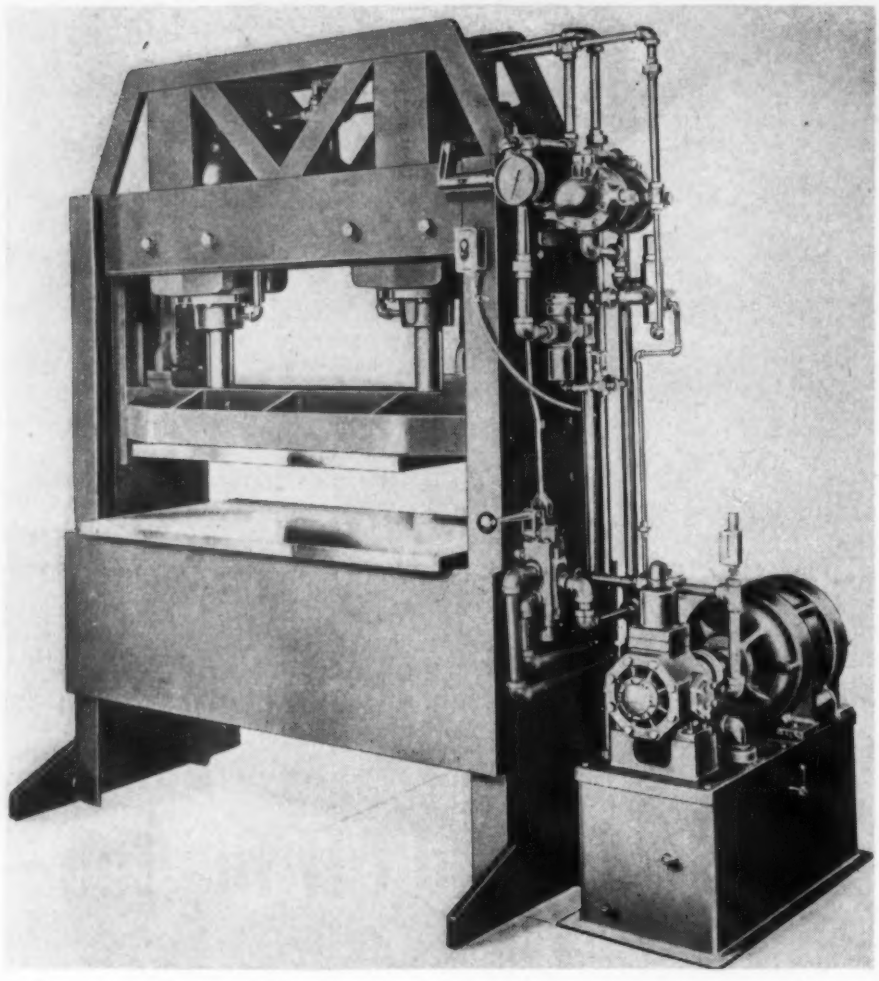
McCrosky reamers are furnished with straight or taper shanks, or in shell design with straight or tapered holes for mounting on hardened arbors. Sizes up to 6" in diameter with High-Speed blades. Larger sizes, or reamers with cobalt, cast alloy or carbide tipped blades on special order. Send for Bulletin 16-A. Gives full details.

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of
Jack-Lock MILLING CUTTERS
Block Type BORING BARS
Wizard CHUCKS AND COLLETS
Super Adjustable REAMERS
Turret TOOL POSTS

Wilson 80-Ton Forming Press Has Light Welded Construction



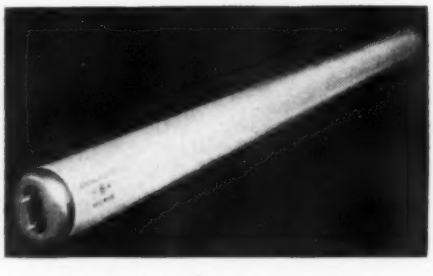
Hydraulic cylinders at each side provide pressure in this structural-frame forming press

An 80-ton blanking and forming press which is said to employ much lighter construction without sacrificing operating efficiency is announced by K. R. Wilson, Buffalo 2, N. Y.

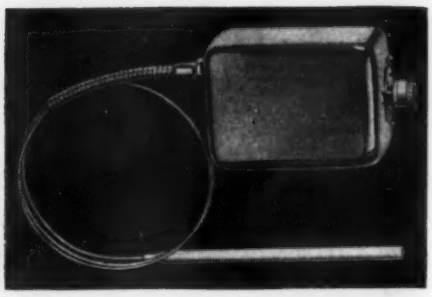
Two heavy-duty hydraulic cylinders develop controlled pressure to perform the work. Pressure is equalized between the cylinders with a mechanical linkage and torque-bar arrangement. The press frame is a weldment, dimensions of which may be altered to suit particular requirements.

The press is designed for blanking, stamping, and forming sheet metal parts, cutting cloth, rubber, asbestos and similar materials with steel rule dies. It can be adapted to compression molding of rubber, plastics, or ceramics or other operations requiring relatively light pressures over fairly large areas. Frame changes permit adaptation to product or to alterations in production setup.

GE Has Full Line of Lights In New 4500-White Color



A complete line of fluorescent lamps is now available in the 4500-white color, it is announced by General Electric Co., Nela Park, Cleveland, Ohio. Previously announced in two sizes, the color has been popular because it provides a balance between the present white and daylight colors. Lamps are now available from 6- to 100-watt sizes.

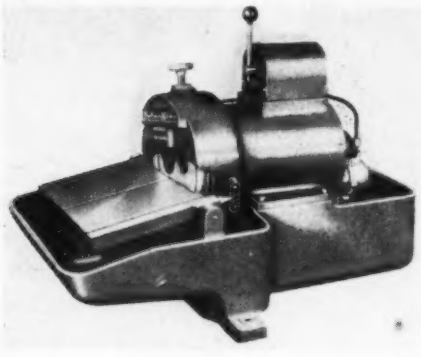


THERMOSTAT — Type O industrial thermostat, made by United Electric Control Co., Boston 27, Mass., can be used for all liquid or gases non-injurious to brass. Control is based on a snap-action switch actuated by a liquid-filled copper thermo-assembly. Adjustments over a limited range are made by setting a calibrated dial, and over a larger range by screwdriver settings, giving the unit wide versatility

Wickman Carbide Tool Grinder Uses Steel-Bonded Diamond Wheel

The Wickman-Neven bench grinding and lapping machine for sharpening carbide tools with a steel-bonded diamond wheel is announced by The Wickman Corp. 15533 Woodrow Wilson Ave., Detroit 3, Mich.

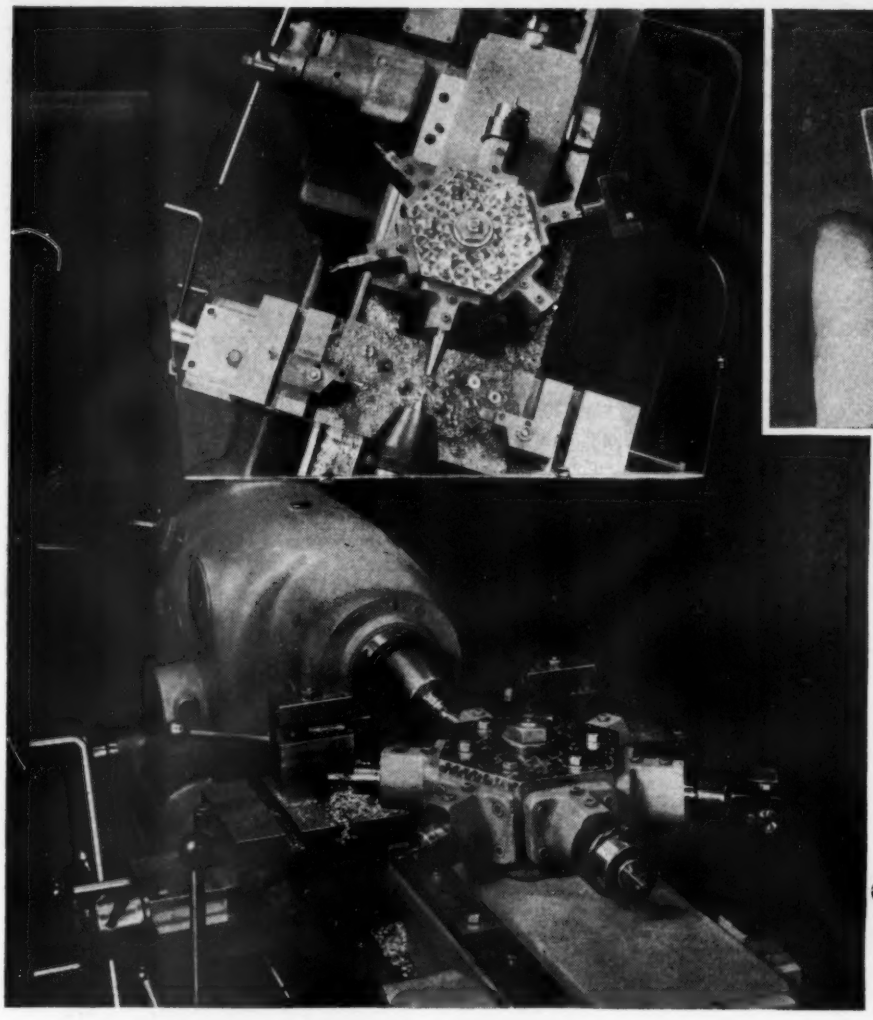
Power for the steel-bonded diamond

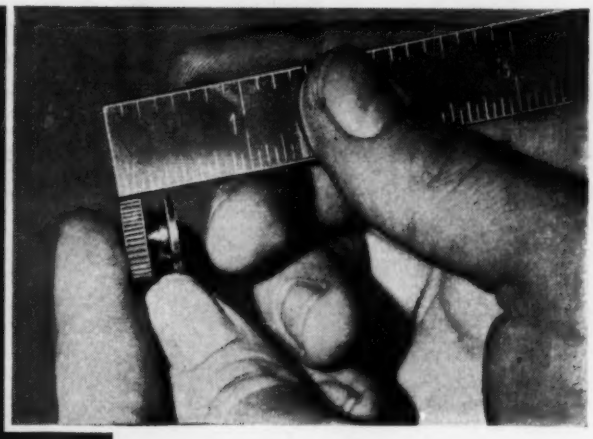


wheel is provided by a 1-hp. spindle motor of special design to withstand frequent reversal. A coolant pump is furnished as standard equipment, with a reservoir cast in the base of the machine, which can be bolted to a bench.

For convenience in sharpening right- and left-hand tools, the direct-driven grinding wheel is reversed by a switch on the top of the motor. The wheel guard can be swiveled to right or left as required. The table can be set at any angle from 5° above horizontal to 15° below, to suit requirements of the tools being ground on the machine.

36.6 SECONDS FROM BAR TO FINISHED PART





Part—Knurled Clamp Nut
Material—Brass, 5/8" Bar Stock
Preselected Spindle Speeds—5
Time Per Piece—36.6 Seconds
Setup Time—43 Minutes

Here's another outstanding case of Speedi-Matic savings on repetitive manufacturing—knurled nuts rolling out at the rate of almost 100 an hour!

Each nut requires six speed changes per cycle. Time: 36.6 seconds! Small wonder that users everywhere are calling the Speedi-Matic "the world's fastest hand screw machine!"

The Monarch Mirror shows the reflection of this efficient production setup: 7 operations, using 5 positions on the hexagon turret, plus the front and rear cut-off slides. The tooling is typical of the class of job on which you can save time and money with a Speedi-Matic. It combines maximum production with extreme accuracy on lots of 25 to 500 or more. Get the full facts *now*, while deliveries are still favorable.

THE MONARCH MACHINE TOOL CO.
Sidney, Ohio

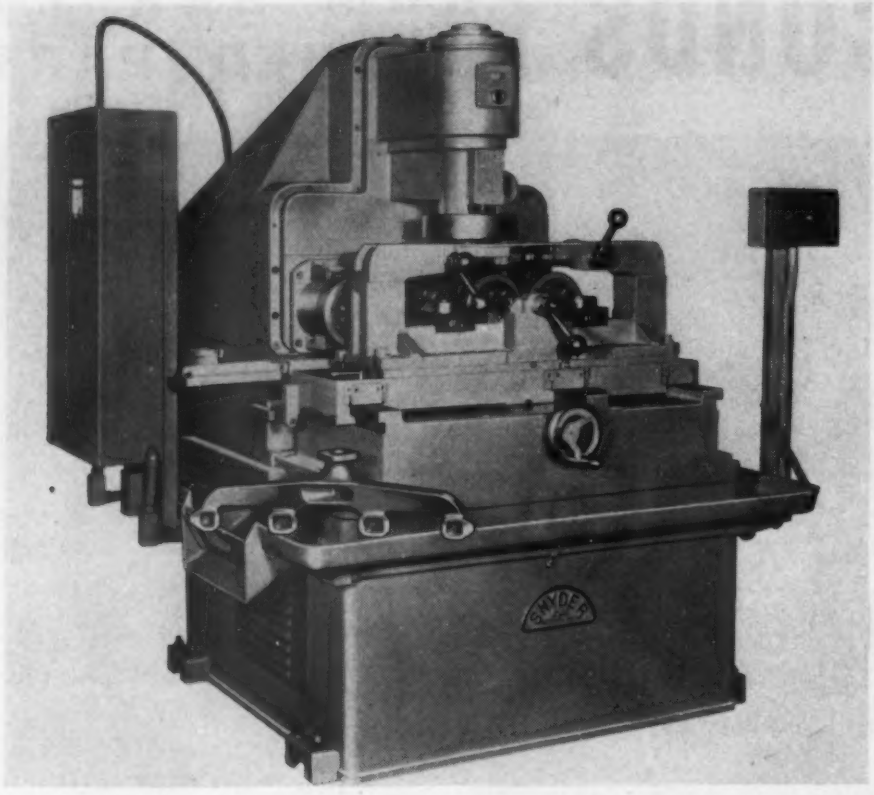
ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

FOR PEAK PRODUCTION AT A PROFIT SPECIFY SPEEDI-MATIC

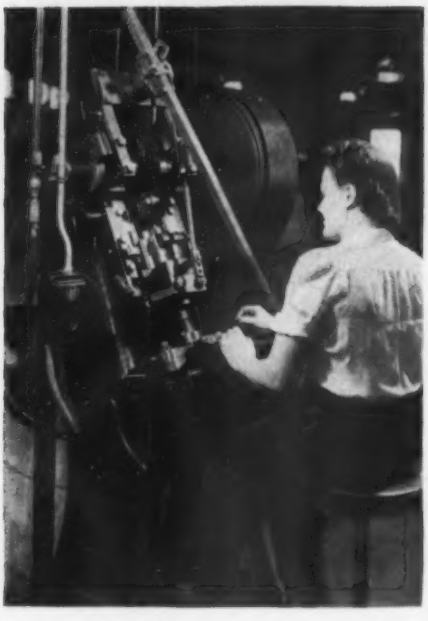
Here's what you get:

- Automatic electronic speed change, preselected for as many as ten stations.
- Complete range of spindle speeds—50 to 5000 rpm.
- Feeds from .0005" to .016" per revolution.
- Power feed ram-type turret.
- Spring-return hand-operated cut-off slide.
- Air-fed pusher-type collet attachment.
- Collet chuck capacity—⅞".



MILLING AUTOMOTIVE MANIFOLD—Pads are milled on automotive manifolds in this five-spindle machine, built by Snyder Tool and Engineering Co., 3400 E. Lafayette, Detroit 7, Mich. Guides locate the part in the work-holding fixture. Operation is automatic once the starter button is pressed

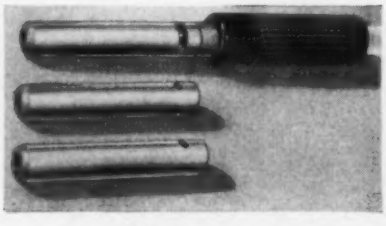
All American Punch-press Guard Is Attached to Press Ram Head



A punch-press guard, the "Safe-Sweep," is made by All American Safety Equipment Co., 11 S. La Salle St., Chicago 3, Ill. The guard is attached to the ram head and can be adjusted to sweep the entire length of the bolster, or to operate between tie rods.

The feed and radius of sweep are adjustable.

Attachment Permits Brazing With Standard Welding Torch



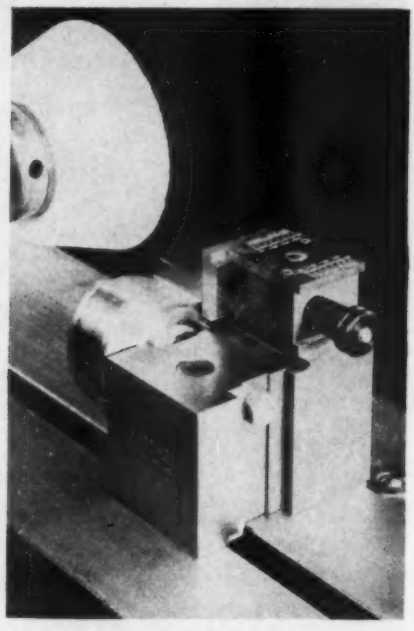
An attachment to adapt standard oxy-acetylene welding torches for soldering, tinning and light brazing is announced by the Acet-A-Tip Co., 5069 W. Madison St., Chicago 44, Ill.

The Acet-A-Tips are attached to the welding torch tip with a 2-in. length of hose which fits over the welding torch tip. In use the acetylene pressure is set at about 5 lb. and the flame is adjusted by the torch valve. Oxygen is not used.

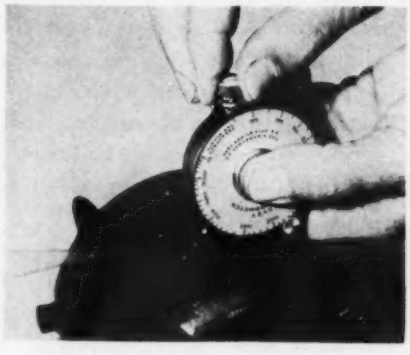
Hardinge Fixture Both Sharpens And Checks Circular Form Tools

A sharpening and checking fixture for circular form tools is announced by Hardinge Brothers, Inc., Elmira, N. Y. The fixture can be applied to the table of any standard tool grinder.

Circular form tools for either right- or left-hand cutting, having plain, octagon, serrated, ratchet, or pin-type hubs can be sharpened. The tool is sharpened and the sharpening is checked without removing the tool from the fixture.



The sliding gage bar is used to position the cutting edge for sharpening and to check the operation. The setting of this bar is governed by a direct-reading graduation on the top of the fixture.



VIBROMETER—This 5-oz. instrument, the Davey Reed Vibrometer, measures machine vibrations within the range of 450 to 50,000 cycles per min. Made by the Vibroscope Co., 6 E. 39th St., New York 16, N. Y., it can be used for noise analysis

Today, in Many Plants... these 3 ways may be the Only Ways to REDUCE ASSEMBLY COSTS

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

1 American Phillips Speed: Time-savings as high as 50% come directly from greater ease of handling, faster starting, and faster driving with power drivers.

2 American Phillips Accuracy: Screw and 4-winged driver fit together into a single, solid unit that *can't drive any way but straight.* Screws turn up tight and flush every time. No scars on work-surface. No burred screwheads.

3 American Phillips Mastery of Metals: American's Engineering Research Laboratory gives you extra savings that stem from recommending the right type of screw in the *right metal for the job*... not only steel, brass and bronze, but also stainless steels, aluminum, monel, everdur. Bring *your* fastening problem here to the *"Information Center"*... where you may well find savings far beyond any you thought you could make.

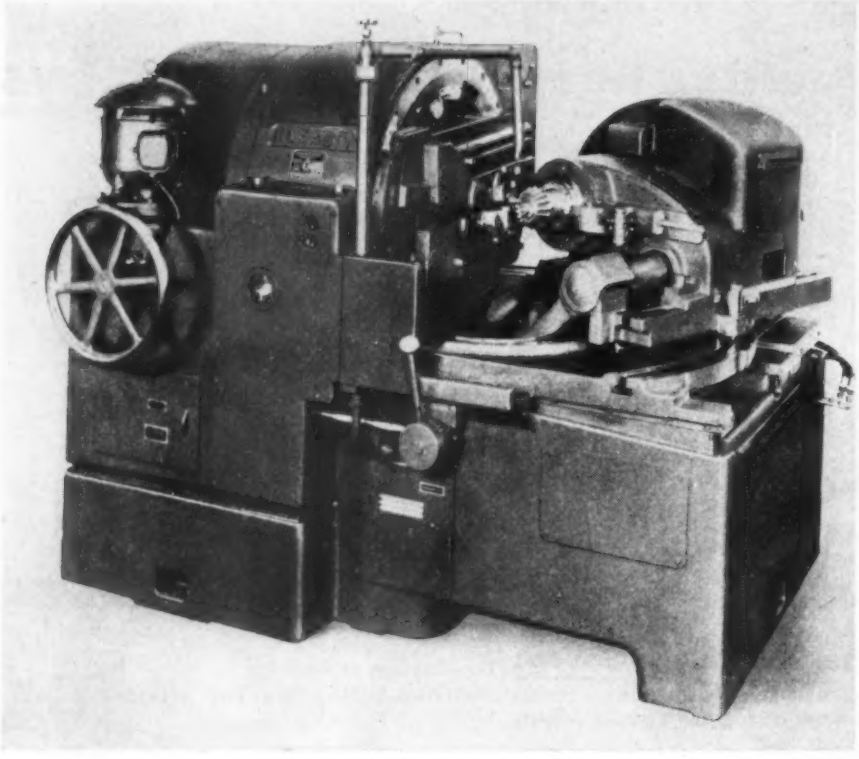
AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND
Chicago 11: 589 E. Illinois Street *Detroit 2:* 502 Stephenson Building

Cut your costs in these 3 ways, with:

AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Commercial Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Gleason Straight Bevel Generator Produces Localized Tooth Bearing



The Gleason 12-in. B model straight bevel gear generator handles gears up to 24-in. pitch diameter, 3½-in. face length, and 3 diametrical pitch

Improvement has been made in the straight bevel generator for cutting gears in the intermediate size range, now designated 12-in. B, made by the Gleason Works, 100 University Ave., Rochester 3, N. Y. The same basic features are incorporated in the No. 24 straight bevel generator for cutting large gears. The latter can handle gears up to 35½ in. pitch diameter, and 1½ diametrical pitch in large or small quantities.

The machines employ two side-cutting tools which operate alternately on opposite sides of the gear tooth being cut. It is now possible to obtain a localized tooth bearing which is said to save time in assembly by permitting a tolerance in mounting the gears, allow for small deflection under operating loads, without concentrating the load on the ends of the teeth.

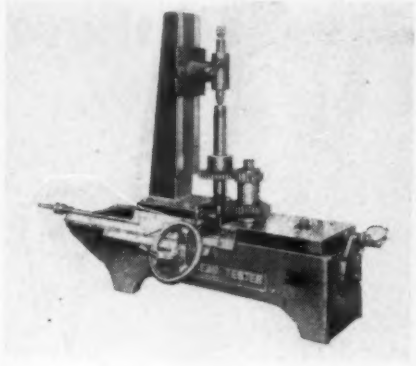
This is produced by means of a cam operating endwise on the tool slide guides, so that the toolslides are positively advanced at each end of the forward cutting stroke. This makes the gear tooth slightly crowned at the center. A fixed amount of crowning is built into the cam, so that no adjustments need be made for cutting different gears.

Other changes in the machine are intended to give faster cutting through greater rigidity and ease of operation. Withdrawal of each tool on the return stroke is accomplished with the same cam mechanism which produces the localized tooth bearing. Tools are more rigidly supported than in the earlier model. Close roughing must still be maintained in order to secure good finish and longest tool life at fast finishing feeds. Standard roughing and finishing tools employed are the same as those used on the earlier model.

Scherr's Parkson Gear Tester Is Made in Two New Models

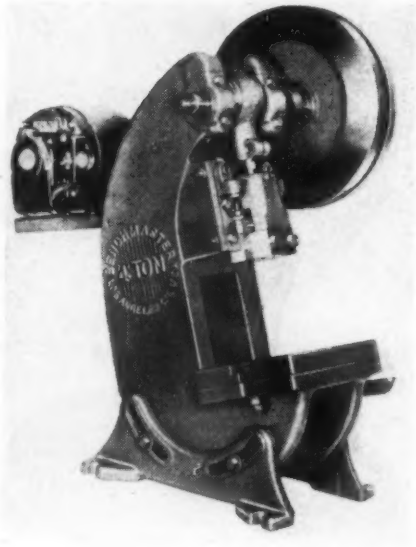
Two new models of the Parkson Gear Tester are announced by the George Scherr Co., 200 Lafayette St., New York 12, N. Y. Both have a maximum capacity of 15 in. center distance.

One of the new models is equipped with a box-shaped upright which carries an adjustable bracket with means for clamping it in any desired position. This provides vertical centers for holding gears or pinions mounted on shafts or arbors.



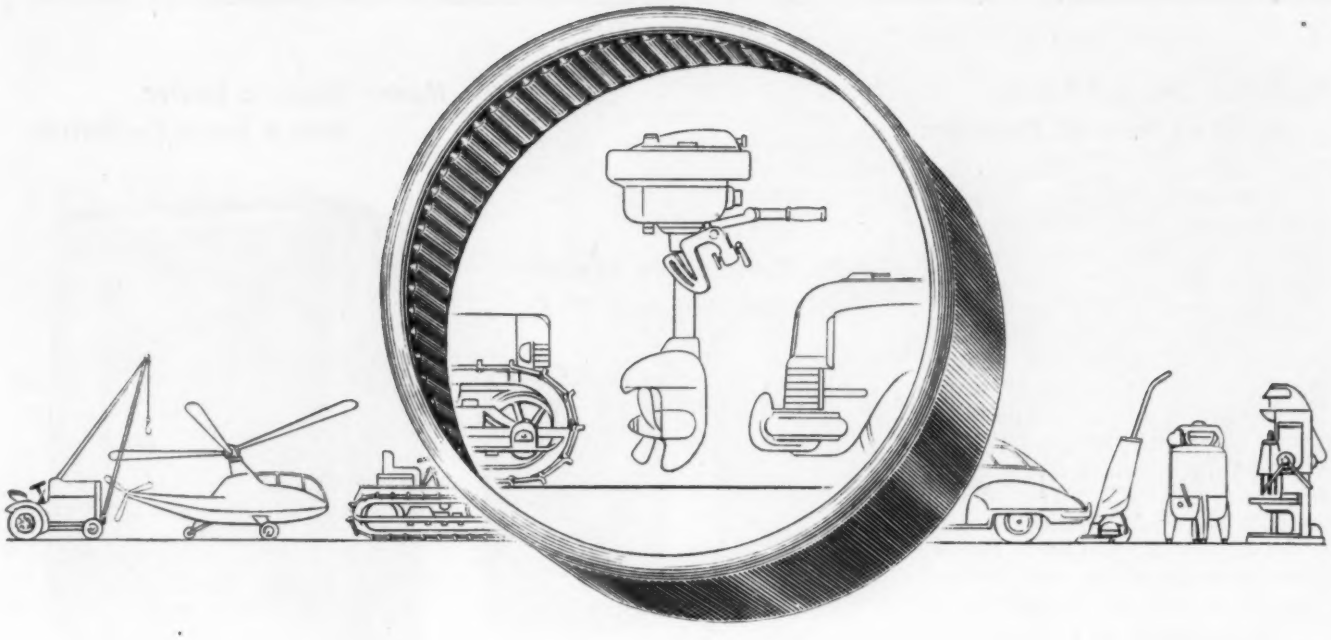
The other model is designed for testing internal gears, either against the mating pinion or against a master pinion. This model has an arrangement to reverse the pressure at will so that internal gears may be inspected as well as external gears.

Benchmaster 4-Ton Punch Press Improvements Include Open Back



An improved model of the four-ton bench punch press is announced by Benchmaster Mfg. Co., 2952 W. Pico Blvd., Los Angeles 6, Calif.

The press weighs 215 lb. and operates at a speed of 285 rpm., with a 1725 rpm. motor. An open back permits work to be inserted from the front as well as from the side. With the ram in the up position, a 5¾-in. die space is available.



Here is another way to make your product stand out!

Yes, many diversified products stand out among their types—in terms of compact design, operating efficiency, maintenance economy and service life—through the use of Torrington Needle Bearings.

For these compact units allow *sturdier* construction with *simpler* housings... assure *maximum* efficiency of operation with *minimum* attention... pack a *higher* capacity into a *smaller* relative O.D.... provide *valuable* anti-friction operation at *low* initial cost.

If your problem is one of making your product *stand out* with little change in design and minimum re-tooling, or securing the advantages of anti-friction operation with lower costs all along the line, write for our latest Needle Bearing Catalog No. 32. Our engineering department will welcome the privilege of working with you in the layout or application of any problem regarding the use of Needle Bearings in *your* product.

THE TORRINGTON COMPANY
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Offices in All Principal Cities

TORRINGTON NEEDLE BEARINGS

Parts and Materials

GE Plastic Caps and Sleeves Shrink on Parts for Protection

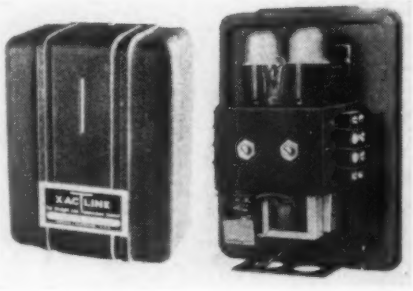
A new method of processing a plastic material to afford a protective means for industrial products, is announced by General Electric Co., Pittsfield, Mass.

Possessing good electrical, physical, and chemical properties, the material is tough, durable, and resilient, as well as water, acid, and alkali resistant. It is available in the form of caps and sleeves which are expanded by immersing in a dilator solution for 2 to 4 hr. While dilated the unit is placed in position and allowed to dry. It shrinks to smaller than its original size and forms a tight fit around the products without losing any of its physical properties. It may be removed by cutting with a knife.

The material may be incorporated in the design of a product such as a covering for busbar insulation, as terminal ends or as an electrical or mechanical seal for wires and tubing. Or it may be used as a temporary protection during storage and shipment or during fabrication. One of its best applications is to form a protective covering for threaded parts of various types of equipment.

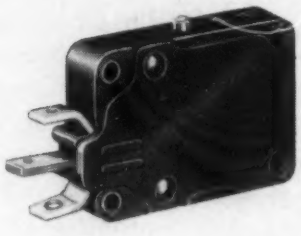
The caps and sleeves are available in any desired lengths and in diameters up to 1 in. However, since they swell to half again their original size and may be stretched beyond this, diameters up to two inches can be covered. The material is said to last for years without splitting or cracking. It is not affected by conventional baking cycles, and is resistant to plating and degreasing solutions, which might recommend it for certain masking operations.

Gordon Temperature Control Holds Variation to 1/5° F.



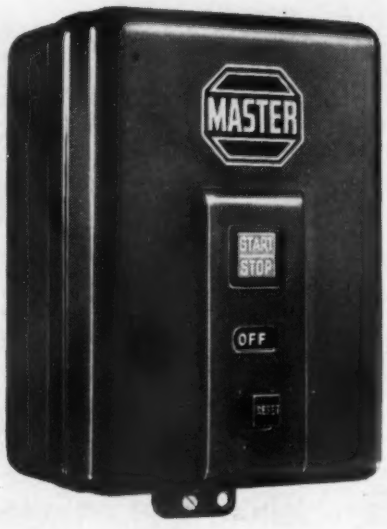
A temperature control said to keep variation as low as 1/5 of a deg. F. is made by Claude S. Gordon Co., 3000 S. Wallace St., Chicago 16, Ill. With the Xactline temperature control, power "on-off" cycles as short as 3 sec. have been attained.

The unit can be used on all types of electric furnaces, ovens, and injection molding machines, using millivolt meters and potentiometer-type controlling pyrometers or gas-fired equipment using solenoid-controlled or motor-operated valves.



SNAP SWITCH—Model "M" rolling spring snap-action switch has a new molded case for greater strength. Size of barriers between the terminals has been increased. Heavier solder terminals are used with 0.082 in. terminal holes to make wiring easier. Used for single or multiple assemblies, it is made by Acro Electric Co., 1321 Superior Ave., Cleveland 14, Ohio

Master Magnetic Starter Uses a Single Pushbutton



An ac. across-the-line magnetic starter is announced by Master Electric Co., 126 Davis Ave., Dayton 2, Ohio. A single pushbutton is used for starting and stopping. A visual mechanical signal indicates whether the motor is on or off.

The starters provide low voltage and overcurrent protection. Standard voltage ratings are 115 and 230 (dual voltage) for single phase, and 110, 208, 220, 440 and 550 for polyphase motors.

Michigan Tool Speed Reducers Built with Cone-Drive Gearing

A complete line of compact speed reducers, built around double enveloping Cone-Drive gearing has been announced by the Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich.

Cone-Drive gearing is said to have greater load-carrying capacity than any other type of right-angle reduction gearing, with the result that smaller gears can be used to transmit a given load.

The new line includes models with pinion under, pinion over, and with gear shaft vertical. Center distances are from 2 to 18 in. and cover a power-transmission range equivalent

STILL LOOKING INTO THE FUTURE

YESTERDAY...

wirebrushing was tops

Yes . . . yesterday wirebrushing structural steel to prepare a base for shop coats was the method preferred by steel fabricators. But it had its drawbacks: It was costly . . . slow . . . primer coats cracked and lifted, and had to be replaced at frequent intervals.

TODAY...

it's flame cleaning and dehydrating!

Now, better bases for protective coatings on structural steel are prepared rapidly by this modern oxyacetylene process which slashes costs more than 75%. Developed by Airco in cooperation with a large steel fabricator, flame cleaning and dehydrating completely frees the surface of rust and scale . . . drives out all hidden moisture and produces a dry and warm surface from which primer coats will not crack and lift.

AND TOMORROW...?

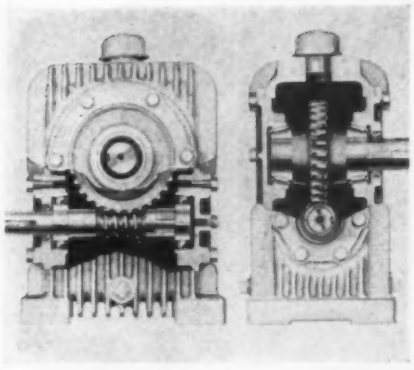
You can look ahead to new and even more important developments to aid the metal working industry — thanks to Airco's accelerated research and development program.

The facilities of our Technical Sales Division are available to all metal working men in applying Airco processes in the solution of their problems. For additional information, get in touch with your nearest Airco office or write: Air Reduction, 60 E. 42nd St., New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, Houston 1, Texas.

AIRCO **AIR REDUCTION**

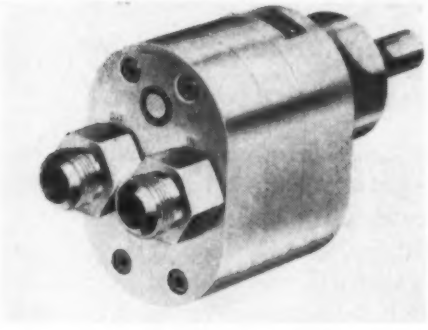
Offices in All Principal Cities

ORIGINATORS OF MODERN OXYACETYLENE METHODS FOR THE METAL WORKING INDUSTRY



to 3 to 24 in. center distances in worm gearing. The available ratios range from 5 to 1, up to 70 to 1. Housings are of box type with cooling fins. A large oil capacity is provided for lubrication and heat conduction. Splash-type oiling is used. Horsepower ratings range up to 800 hp. input to the pinion.

McIntyre High-Pressure Pump Is Produced in Four Sizes



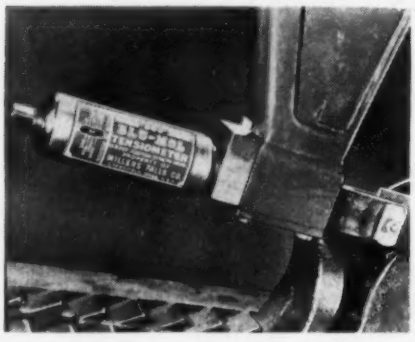
The Series 700 pump for high-pressure application in machine tools, material-handling equipment, and other applications, is announced by the McIntyre Co., 15 Riverdale Ave., Newton 58, Mass.

A direct-drive, spur-gear pump, weighing 6 lb., it is said to operate with a volumetric efficiency of better than 90% and a mechanical efficiency of better than 80%. The four models displace from 0.4 to 9.6 gpm., at speeds ranging up to 1750 rpm. against working pressures up to 1,000 psi. The pump body is constructed of aluminum with nitrided nitralloy gears.

Millers Falls "Tensiometer" Sets Hacksaw Blade Tension

A "Tensiometer" designed to set and maintain correct blade tension on power hacksaws is announced by Millers Falls Co., Greenfield, Mass. It is a small cylinder, inclosing a strong, calibrated spiral spring.

The unit is attached to the blade holder of the machine and acts as a shock absorber for the blade. Desired tension from 0 to 4000 lb. can be obtained. This is said to improve the accuracy of the cut, maintain substantially constant tension in spite of thermal expansion, and increase the cutting life of the blade.



Photoswitch Photoelectric Units Designed for Machine Application

Two photoelectric controls, Series 20 and 21, designed for general industrial and machinery application are announced by Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.

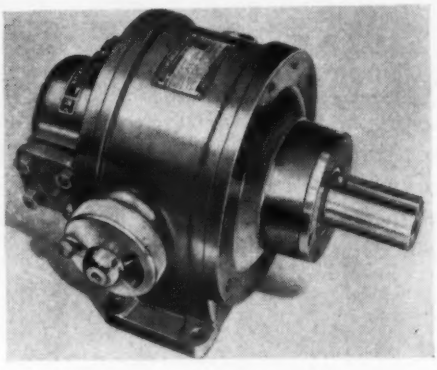
Designed for high-speed operation, the relay operates in 1/20 of a second, the operating range is 20 ft. A tamper-proof sensitivity adjustment is provided to permit operation over varying distances between phototube and light source. The control is designed to operate under conditions of high temperature and humidity, if necessary.

Air Reduction Sales Announces An Extrusion-Coated Electrode

An extrusion-coated self-hardening electrode manufactured by the Stoody Co., is being marketed by Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. The extruded coating is said to be much stronger, have less tendency to pick up moisture, present a better appearance, and to be completely uniform. It can be used with either ac. or dc. machines.

Applications of the electrode include hard facing in building up worm areas of tractor lugs, shovel teeth, manganese steel crushing equipment, hampers, and other equipment.

Superdraulic's Triport Motor Has 66 Strokes Per Revolution



An industrial hydraulic motor said to combine high starting torque with turbine-smooth power, has been announced by Superdraulic Corporation, Dearborn, Mich. Known as the Triport Motor, the compactness of the motor is said to make direct drive available for many machines. The 47-hp. motor is only 10½ in. in dia. Torque range is as high as 200 lb.-ft.

The motor is available in two types; one rated at 26½ gpm., with 3,500 psi. input at 1200 rpm.; the other at 19 gpm., with 5,000 psi., at 1200 rpm.

The motor has infinitely variable speed control, forward and reverse, with a convenient finger volume control valve. The design provides 66 power strokes per revolution, which is said to produce turbine smoothness.

New Silver Brazing Alloys Have Lower Silver Content

Two new silver brazing alloys with lower silver content have been announced by Handy and Harman, 82 Fulton St., New York 7, N. Y.

Easy-Flo 45 contains 45% silver with copper, zinc, and cadmium. The melting range is 1120 to 1145 F. It is said to offer the full advantages of alloys with a higher silver content with economy to help offset increase in the price of silver.

Easy-Flo 35 is 35% silver with a melting range of 1115 to 1295 F.

"Measuring at the Machine"
MINIMIZES PRODUCTION LOSSES!

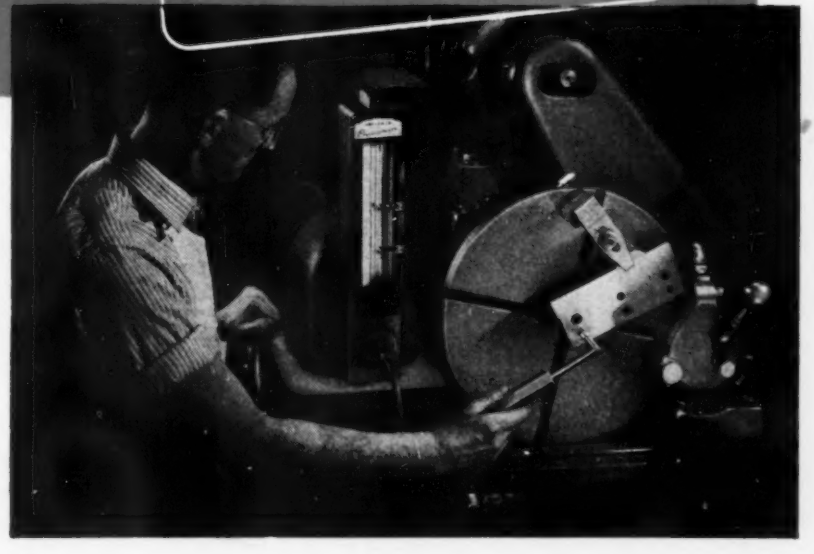
Reducing production LOSSES means reducing production COSTS. LOSSES usually occur at the machine—stopping such losses brings down costs.

"Measuring at the Machine" brings the following advantages which contribute to being able to sell a product profitably at or under competitive prices:

1. When accurate gaging is practiced right at the production machine, scrap losses have been reduced as much as 80% and 90%.
2. "Measuring at the machine" practically eliminates salvage work which is nearly always costly.
3. Component parts reaching the assembly line fit quickly and easily—no assembly time lost. Instead of working to the high limit as an operator normally does, he works to hit the part "on the nose."
4. When high production gaging instruments like the Multichek, Precisionaire and Visual Gage are used at the machine, the floor space devoted to inspection operations, gage maintenance costs and the labor cost of inspection are all greatly reduced.
5. Under close dimensional control, finished products give maximum performance, greater service life, and help build prestige for the manufacturer.
6. Fewer parts will wear out in service, and then replacement is quickly and easily done —no laborious fitting in the field will be necessary.

chek with Sheffield on "Measuring at the Machine"

1747



SHEFFIELD MASTER CRAFTSMEN

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U. S. A.

MACHINE TOOLS...GAGES
MEASURING INSTRUMENTS
CONTRACT SERVICES

OUT OUR WAY

DO YOU REALIZE WHAT IT WOULD HAVE COST TH' COMPANY IF WE HADN'T USED SOL-SPEEDI-DRI?
LOOK AT IT! THERE IT IS, IN BLACK AND WHITE! THE DUMBEST GUYS IN THE SHOP CAN SEE THAT SOL-SPEEDI-DRI CUTS ACCIDENT RATES TO THE BONE! AIN'T BEEN A SLIPPING ACCIDENT SINCE WE STARTED USING SOL-SPEEDI-DRI ON TH' FLOORS!
LOOK AT 'EM RUBBIN' IT IN! YOU'D THINK THEY CLEANED UP ALL THAT GREASE AND OIL WITH THEIR NECK-TIES INSTEAD OF SOL-SPEEDI-DRI! THEY'VE BEEN SMART AN' NOW THEY'RE CROWIN!
HARMONY AIN'T SO GOOD-- IT'S WHEN ONE GUY WORKS HIS HEAD OFF TO SHOW UP TH' OTHERS THAT YOU REALLY GET RESULTS!
T. M. REG. U. S. PAT. OFF. COPR. 1946 BY NEA SERVICE, INC.
THE WISE BOYS
J.R.WILLIAMS

RECORDS SHOW THAT SOL-SPEEDI-DRI MAKES FLOORS CLEANER... SAFER

ACCIDENT RATES go down but workers stay on their feet when you use SOL-SPEEDI-DRI on oil-soaked, grease-slicked floors! SOL-SPEEDI-DRI . . . the white, granular absorbent . . . works like a charm on all types of floors, soaking up soluble oils, resins, syrups, solvents, acids, coolants, and regular oils and greases as a blotter soaks up ink.

No complicated machinery . . . no trained personnel . . . is required to use SOL-SPEEDI-DRI. One man can do all the work necessary. SOL-SPEEDI-DRI is economy-wise because it releases cleaning personnel for more productive work. It's production-wise because it keeps men on the job, free from the hazards of slips and falls. SOL-SPEEDI-DRI also reduces the dangers of flash-fires over oil-steeped floors. It will not readily burn, even when oil-soaked.

SUPPLIERS:

East—Safety and Maintenance Co., Inc., New York 1, N. Y.
South, Midwest and West Coast — Waverly Petroleum Products Co., Philadelphia 6, Pa.

FREE SAMPLE
Get the full story of SOL-SPEEDI-DRI today. Just write "SOL-SPEEDI-DRI" across your letterhead or business card and mail.

SOL·SPEEDI·DRI
OIL AND GREASE ABSORBENT

ROUND TABLE *Discussion*

SHOULD A FOREMAN BE COST-CONSCIOUS?

Manufacturing costs are a problem that every foreman must face. If the company is to be successful, each foreman must operate his department at the minimum of cost and the maximum of quality. It is his duty to know what items of labor, material and overhead in his department are out of line. Since he is close to the problem of manufacturing, he should know how the cost of manufacturing might be lowered.

However, while each and every foreman should be cost-conscious in an organization, there should be a Cost Reduction Department whose sole function is to study continually the over-all manufacturing. This department, with the cooperation of cost-minded foremen, can reduce product cost materially.

The establishing of unit costs of the product being manufactured and the study of these costs by the foremen result in the foremen taking more interest in manufacturing the items. They feel their endeavors to cut costs and increase quality in their own department help build up the company profit and thus make their own positions more secure.

Charles Delmar Townsend
Cleveland, O.

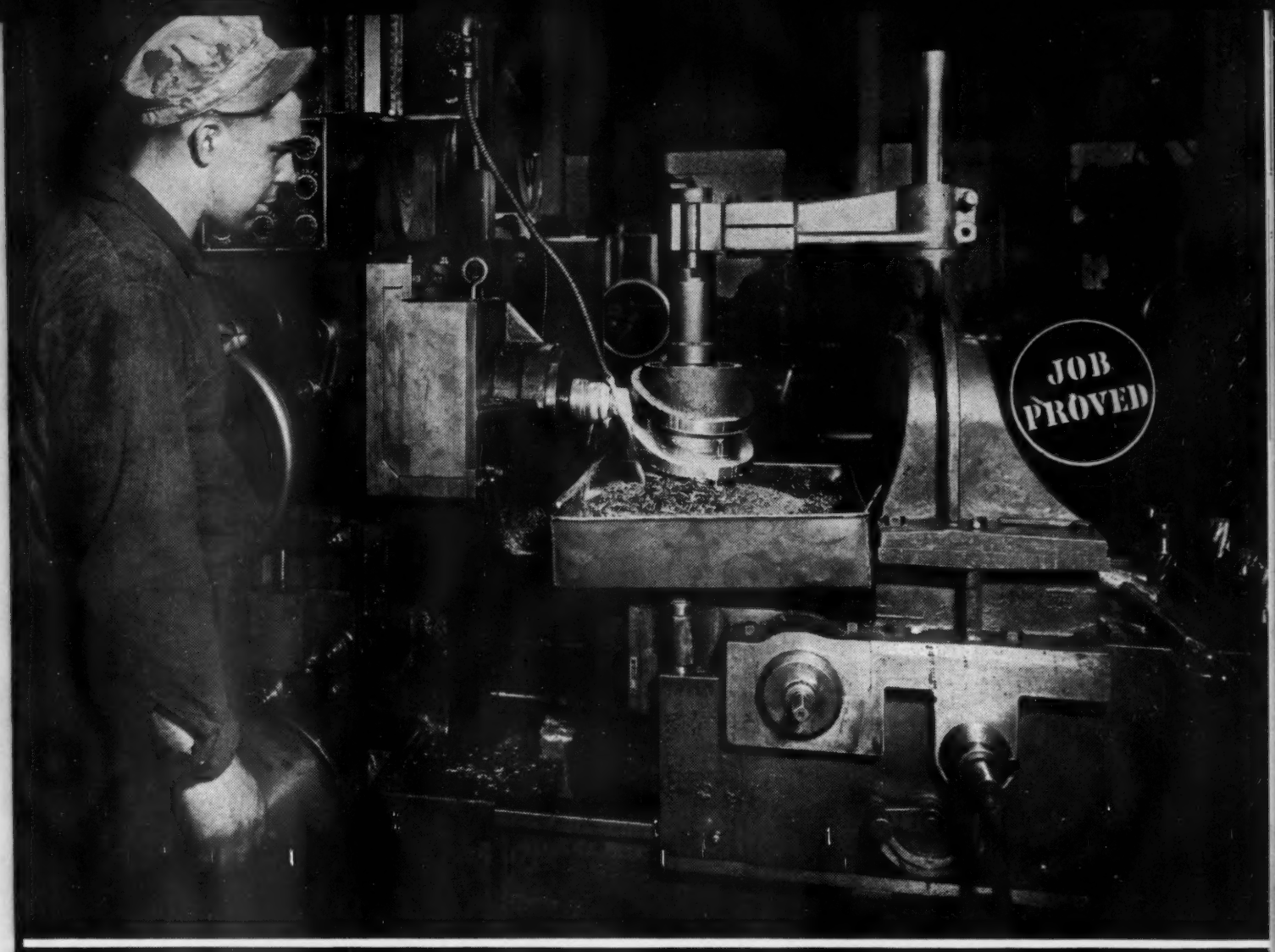
•

IS RABBLE-ROUSING WORTH A PREMIUM?

What is a rabble-rouser? The dictionary says a person who influences large groups of people, usually of the lower classes. There are various types of such—none of them particularly good; most of them bad.

There is the type, found in working groups, who is always ready to agitate. The slightest act gives him an opportunity to gripe. He has a glib tongue with which he incites his fellow employees to their detriment. He is always telling how the job should be run. The management is growing rich at his and his fellow employees' expense—this, in spite of the fact that he is being paid by the management.

Oftentimes his job is that of shop representative to which he has been elected because of his eloquent speeches, and then he turns it to his own use to spread insidious propa-



CUTTER LIFE DOUBLED . . . *Costs cut* 25%

SUNOCO EMULSIFYING CUTTING OIL

Used for Milling Cams, Eliminates Stains and Odor, Produces Better Finish

A well-known machine-tool builder, in the cam-milling operation shown above, was not obtaining satisfactory finish. The cutting emulsion had an objectionable odor and had to be changed every two weeks.

Lubrication costs were cut 25% when they changed to Sunoco Emulsifying Cutting Oil for both milling and grinding. The new oil lasts more than four times as long. Cutter life has doubled. Finish has improved. Objectionable odor eliminated.

The facts: Machine: Rowbottom cam miller
Operation: Milling cams
Material: Air-cooled alloy steel casting
Depth of cut: 3/8"
Tool: High-speed Weldon end mill
Cutting Lubricant: 1 part Sunoco to 15 parts water

In hundreds of shops Sunoco Emulsifying Cutting Oil has been "Job-Proved." It mixes easily with water. Its high cooling and lubricating qualities are important wherever ferrous or non-ferrous materials must be cut with precision and at high speed.

SUN OIL COMPANY · ***Philadelphia 3, Pa.***
Sponsors of the Sunoco News-Voice of the Air — Lowell Thomas

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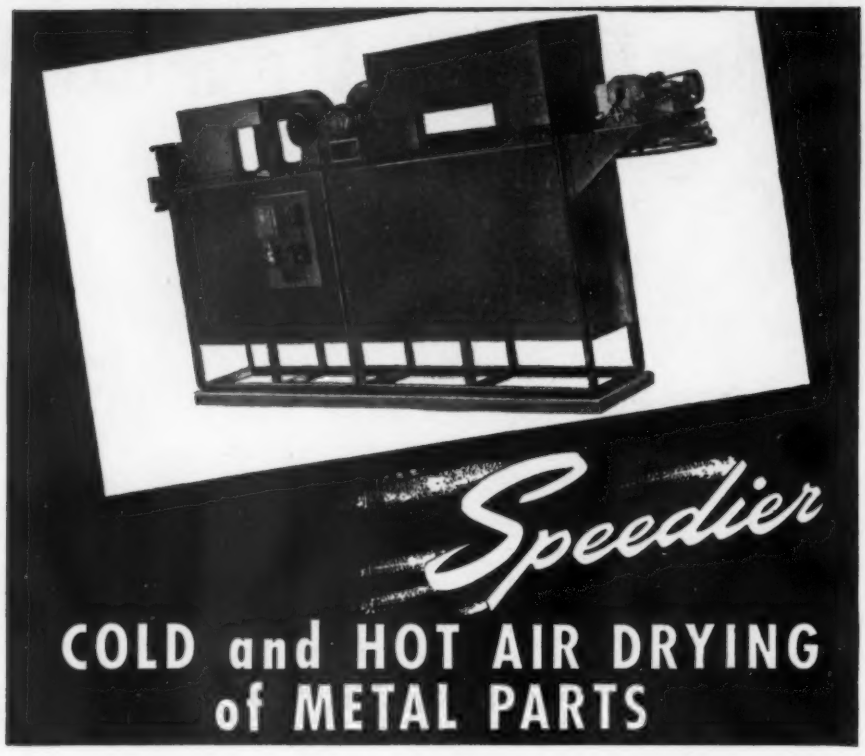

Speedier

COLD and HOT AIR DRYING of METAL PARTS

Faster drying of metal parts on racks is accomplished with the use of the new OPTIMUS Continuous Type Drying Machine. Ideal for handling loaded racks continuously after plating, or after any water solution dip. Drying time runs 4 to 6 minutes.

This new OPTIMUS Dryer is used largely as a cold air and hot air dryer. Cold air system includes a blower and a series of nozzles. Hot air system includes an air heater, re-circulating blower, a damper to adjust the mixture of atmospheric and re-circulating air, and necessary nozzles.

It can be used as a single stage dryer, or it can handle a number of successive operations, alkaline, acid, or neutral. Enclosed design of machine permits efficient ventilation through exhaust blower connection when desired. Can be heated by steam, gas or electricity.

An OPTIMUS Plan for the mechanized handling of your metal parts through washing, rinsing and drying, can help you save labor, reduce rejects and increase your production.

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Your copy of new bulletin

"Cleaning Metal Parts before and after finishing"

DEPENDABLE OPTIMUS DETERGENTS

for every metal cleaning equipment operation.

OPTIMUS EQUIPMENT COMPANY

ENGINEERS AND MANUFACTURERS

151 CHURCH STREET, MATAWAN, N. J.

STANDARD AND SPECIAL TYPES OF EQUIPMENT FROM THE SMALLEST TO THE LARGEST SIZES FOR A WIDE VARIETY OF OPERATIONS.

OPTIMUS EQUIPMENT

FOR WASHING · RINSING · PICKLING AND DRYING OF METAL PARTS

ganda. This type of rabble-rouser can well be dispensed with.

Another type is the one who, though not quite so loud in his speech, nevertheless causes as much harm. He notes petty infractions and carries them to the management. Oftentimes he stirs up agitation so he can carry tales to the supervisors. He is a menace to the good feeling between employer and employee.

Then there is the one who works on the outside. Call him a rabble-rouser, if you wish. He gets big pay for what appears to be little effort. However he knows his people, he knows where to make contacts, how to approach people, how to influence them; he knows just how far to go in order to conclude his deals. He is the fellow through whose efforts the management is able to keep the employees happy and contented and thus bring success to the business. His type is really worthwhile.

P. H. Pearson,
Lynn, Mass.

•

MOUTHPIECE OR MANAGER?

A foreman should be in complete charge of his department, including men, machines and material. In plants having sound employee relations, a foreman's advice is sought and acted upon by departments in a position to sanction or reject requests of persons working under that foreman. Such departments should never go above the head of a foreman. Otherwise a foreman is only such as to output with no control over men.

W. E. Warner
Essex, England

•

SCHEDULED MAINTENANCE?

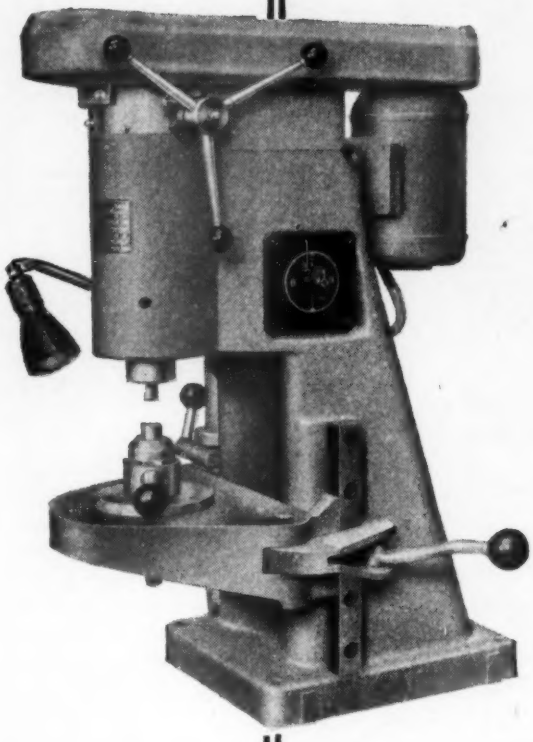
After 25 years experience as a machinist, tool and die maker in many shops in several states, I believe it pays to take care of all machinery, not only at 30-, 60- or 90-day periods, but daily. The boss or foreman should establish a set of simple rules the employee should follow before starting his machine:

1. Oil in proper places.
2. Clean and oil all working parts.
3. Check drive gearing or belting.
4. Use any air hose with great caution.
5. Get the feel of your machine, then determine any slack or play in it. An adjustment in time will save nine.

After getting tooled up, keep a place for everything, and everything in its place. This always pays, as the job or quota can be turned out

Independence from Outside Die Makers

For your Tool Room



Make your tool room production free from losses due to inaccuracies and delayed deliveries by outside Die Makers.

Your dies will cost less and will be more uniform in material and workmanship, if you make them in your own shop, on a

SWISMA

DRILLING MACHINES
for
Round and Multi-Flat Sided Holes and Vertical Cutting

The ONLY machine that will drill either Round, Square and Hexagonal — or, Round, Octagonal and Triangular THROUGH or BLIND HOLES in either Metal or in Plastics.

A rigidly supported Cross-feed Attachment adapts the machine to Vertical Mill Cutting, without any special Guide.

This is the* OUTSTANDING FEATURE *that cuts Production Costs to the Minimum.

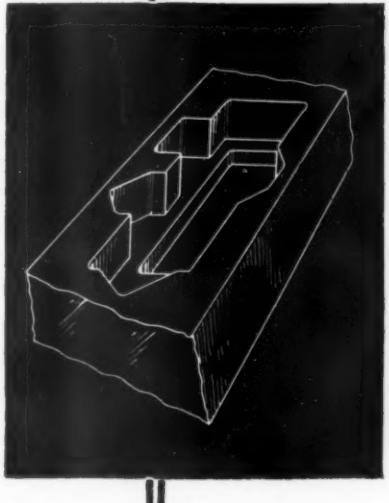
Convenience in setting work pieces of various shapes and sizes is afforded by a round outswinging swivel table, which has an opening to accommodate long pieces, such as spindles.

The machine will drill multi-flat sided holes almost as fast as round holes. The drill is driven by a hardened and ground gear drive, which is so accurately mounted that no guide bearing or template is required.

When used for vertical cutting it will cut adjoining square blind holes with truly parallel sides and very small radius fillets at the corners.

All work is done with the highest precision at high speed, thereby assuring economical, quality production at a low unit cost.

Operation is simple. An apprentice can operate the machine and maintain fast production with superb uniform accuracy.



The opposite sketch shows a typical example of vertical cutting that can be done with the SWISMA by utilizing the swivel table and the supported cross-feed.

The Boring Tool cuts on its face side only. Overlapping edges and bottom surfaces are smoothed to a flawless finish.

The SWISMA DRILLING MACHINE is built in Switzerland to the highest precision standard for which the Swiss are famous. Built to last for many years. Full sets of spare parts are available in New York to meet any emergency repair requirement quickly.

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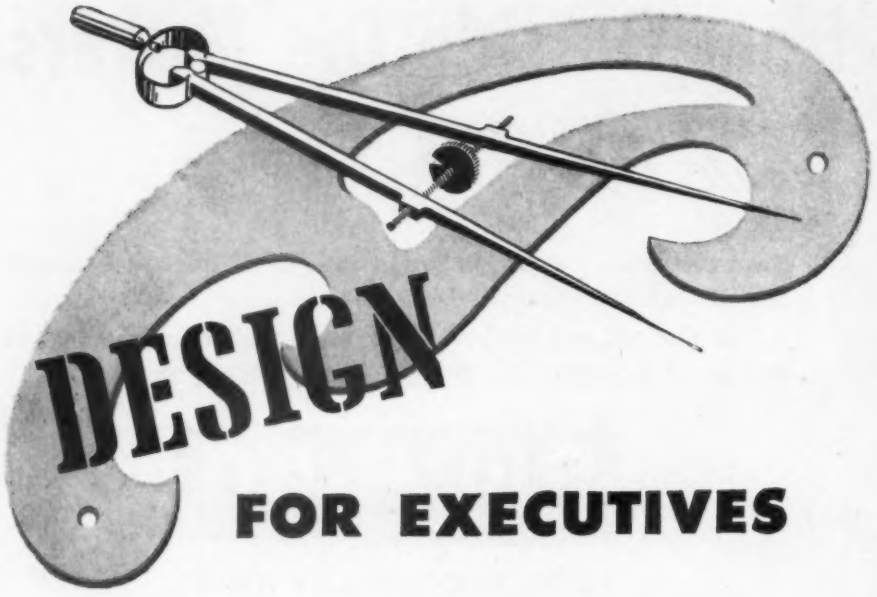

FOR EXECUTIVES

Years ago it may have been all right for a man to start as office boy and work his way up to be president of his organization. The process took years, but there was no better way. Now there *is* a better way.

The design for a successful executive has been "blueprinted." A straight-line production plan has been laid out for *quality* production. The new method fits into today's fast moving conditions, and accomplishes in months what once took years.

The New Way

Through its Modern Business Course and Service, the Alexander Hamilton Institute prepares men for executive positions quickly and scientifically. Institute training is basic and broad. It provides the knowledge that enables men to direct the activities of others—not in one department or one kind of business—but in *all* departments of *any* business. It covers Accounting, Marketing, Finance and Production.

Training of this kind is particularly valuable to technical men who are often denied responsible, high salaried positions because of their lack of business knowledge. The Modern Business Course and Service supplements their technical education, and qualifies them for rapid advancement.

Prominent Contributors

Among the contributors to the Institute's training program are such business and industrial executives as HermanSteinkraus,President,Bridgeport Brass Company; Thomas J. Watson,President,InternationalBusiness Machines Corp. and Clifton Slusser, Vice President, Goodyear Tire & Rubber Company.

Forging Ahead in Business

The manner in which the Institute's Modern Business Course and Service is brought to subscribers is interestingly told in the fast-reading pages of "Forging Ahead in Business." The booklet also contains a great deal of information about the problems facing ambitious men who are looking ahead—and who want to move ahead.

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with less effort.

Plain scrap can be welded, plated and remachined. I have seeen hundreds of various pieces of bad scrap, all traced to carelessness in not following these few rules. Every machinist would do well to remember: "Measure twice and cut only one." This will help in saving material today and every day.

R. Mahre
Minneapolis, Minn.

NEW BOOKS

NATIONAL SECURITY AND THE GENERAL STAFF—*By Major General Otto L. Nelson, Jr. 608 pp. Published by Infantry Journal Press, Washington 6, D. C. Price $5.*

This scholarly and sometimes interesting study of the organization of the Army and the War Department contains a detailed analysis of the development and operation of the General Staff from its inception to the present. Any civilian who has dealt, or expects to deal, with the supply bureaus of the Army will find much here to help him understand the problems of the War Department and perhaps some that will aid him in his dealings with that agency.

But the reader may feel, to paraphrase Clifton Fadiman's little boy, that "this book tells me a good deal more about the General Staff than I am interested in knowing." It is unfortunate that in being documented it becomes wordy, repetitious and dull. It would have been a great help if the publishers had used a distinctive type for quoted matter. Some of the documents included are many pages in length and could well be skipped by most readers.

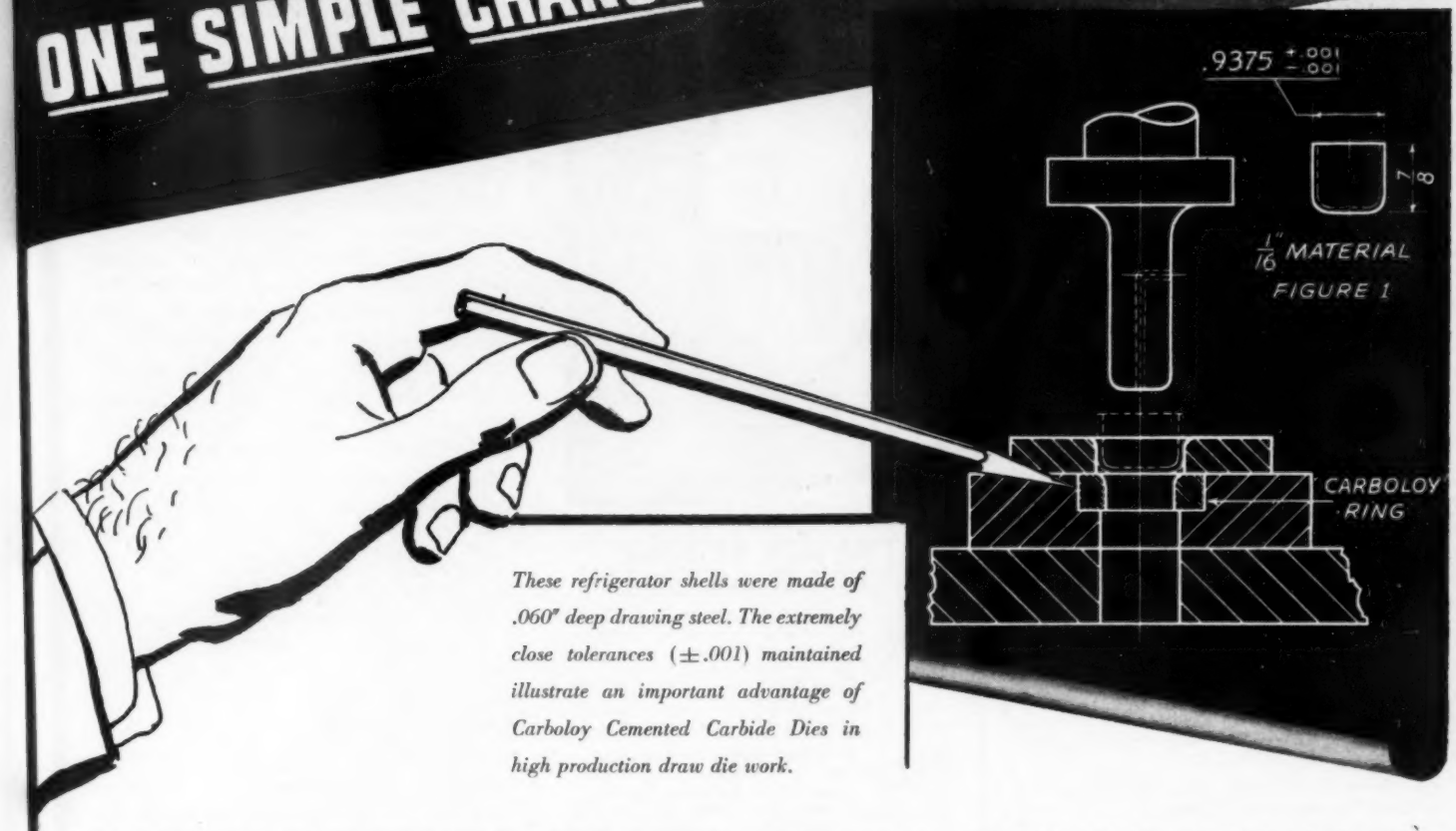
General Nelson has given a remarkably objective analysis for a man who has himself spent several years of General Staff. His account is evidently more frank in the early period than for World War II. He recounts in detail the early battles between the different factions, quotes disputing correspondence between Generals Pershing and March, and tells of an ambitious general (Ainsworth) who habitually signed letters of approval himself but prepared letters of disapproval for the Assistant Secretary of War to build the impression that "Ainsworth is a man who gets things done."

When, on the other hand, in speak-

30,000 PARTS PER DIE POLISH VS.

500,000

ONE SIMPLE CHANGE BRINGS RESULTS LIKE THIS



These refrigerator shells were made of .060" deep drawing steel. The extremely close tolerances (±.001) maintained illustrate an important advantage of Carboloy Cemented Carbide Dies in high production draw die work.

Looking for ways to improve your production? Here's an example of what Carboloy Cemented Carbide Dies will do in *your* plant:

A manufacturer of steel refrigerator shells, using top-quality steel dies, was getting a maximum of 30,000 parts between die polishings. Then he changed to Carboloy Cemented Carbide Dies. Production between polishings soared to 500,000 parts!

Long die life is only one of the many important advantages Carboloy Cemented Carbide Dies brings to your Cupping, Blanking and Drawing operations. Users consistently report closer tolerances on drawn parts—fewer "rejects"—lower cost per piece—virtually mirror-smooth surface finish, with big reductions in buffing time—and sizeable boosts in output-per-press.

For better production, at lower cost, change to Carboloy Cemented Carbide Dies. And for more complete information on how Carboloy Cemented Carbide Sheet Metal Dies can help you, take advantage of the many production-improving ideas contained in our Booklet D-120. Write for your copy today.

11149

Carboloy Company, Inc., E. 8 Mile St., Detroit 32, Mich. (Offices in Chicago, Cleveland, Detroit, Houston, Los Angeles, Milwaukee, Philadelphia, Pittsburgh, Thomaston, Connecticut.)

CARBOLOY (TRADEMARK) CEMENTED CARBIDE

EET METAL DRAWING AND BLANKING DIES

INCREASE OUTPUT

EXTEND DIE LIFE

HOLD CLOSE TOLERANCES

REDUCE "REJECTS"

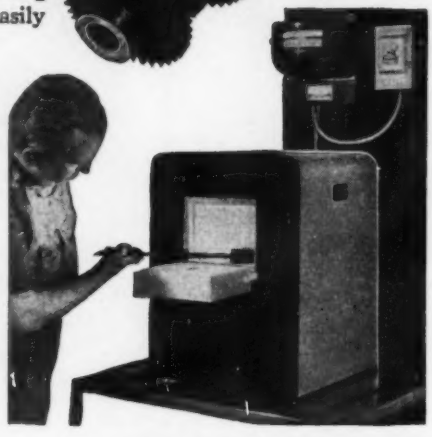
HEAT TREAT SMALL PARTS
In Your Own Plant

ESSENTIAL FOR TOOL AND DIE SHOPS

You save time and money heat treating small tools and dies in a Cooley Electric Furnace. Uniform temperatures are maintained throughout the furnace chamber to assure even heating of parts. The heating elements are embedded in refractory materials, protecting against atmospheric attack. They are easily replaceable.

ECONOMICAL TO OPERATE

To hold 1600° F. in the MH-3 furnace requires less than 2 kw. At power rate of 2c per kw.-hr., operating cost is under 4c per hour. The MH-4 furnace requires less than 2.5 kw. or under 5c per hour at the same rate. Cooley Furnaces are easily installed—ready for immediate service by connecting power lines to two terminals. Quiet in operation—no fumes or odors—no ventilating necessary—they can be located at any convenient place in the shop.



MORE PROFITABLE REASONS FOR USING COOLEY FURNACES

1—Hardening, drawing and tempering small batches in large furnaces is uneconomical.

2—Small parts can be normalzied and annealed quickly and easily.

3—Convenient for pre-heating prior to high-speed hardening.

4—Always available to handle emergency repair work without delay.

5—Use as a pilot furnace to predetermine techniques for production heat treating.

TWO NEW OPTIONAL FEATURES AVAILABLE

1. Vertical Lift Door—Counterweighted for ease of operation—conserves heat where door need not be fully opened to enter or remove work. Supplied in place of standard hinged hearth door at $20.00 additional to regular furnace prices shown below.

2. Heavy Gauge Steel Stand—For ease of installation and operation—locates furnace at most convenient operating height and provides additional working and storage space. Add $35.00 to regular furnace prices shown below.

AVAILABLE IN TWO SIZES

Type	Chamber Capacity	Amps: 115 V	Watts	Amps: 230 V	Price
MH-3	8″W 6″H 14″L	29.6	3400	14.8	$146.00*
MH-4	10″W 6″H 18″L	——	4800	20.9	$222.50*

*Includes Hearth Plate

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—price depends on selection—approximately $150.00.

NO SALESMEN WILL CALL

Ask for free information and ordering instructions so you can make your own decision and determine your own requirements. Write for Bulletin No. 50 today—no obligation.

COOLEY ELECTRIC MANUFACTURING CORP.
48 South Shelby Street Indianapolis 7, Indiana
INDIANAPOLIS MACHINERY EXPORT CORP.
Export Manager, 44 Whitehall Street, New York, New York

ing of the nearly 700 officers of the General Staff at the beginning of World War II, he says, "Certainly all officers of the War Department General Staff try their best to give answers that practically take the words out of the mouth of the Chief of Staff," he seems to be taking a rather charitable view of human nature.

In other respects, too, he seems less critical in his analysis of World War II and only briefly alludes to the running battle between the supply bureaus and the General Staff. He admits the difficulties of the problems disputed in the civilian versus military and the technical versus channelized control arguments, but does not give them the space they deserve, because they are among the most complex and critical problems of the Army.

The final chapter contains an eloquent and well-supported plea for a "top-level staff" to replace the present Joint Chiefs of Staff. Under the present system each member is a representative of one component, of a special interest. "If he is not an uncompromising fighter for the special interests which he represents his work will be regarded as unsatisfactory by those who determine his promotion, assignment, and future success." How can leadership be exercised under such conditions, except possibly in the emergency of wartime?

This chapter deserves to be widely reprinted and should be read by every citizen seriously interested in the National Defense. From the supply standpoint the Joint Chiefs afforded some relief during the war by evolving some joint standards. Such a "top-level staff" could and should greatly reduce the complexity and confusion of the regulations which harry the production of military goods.

•

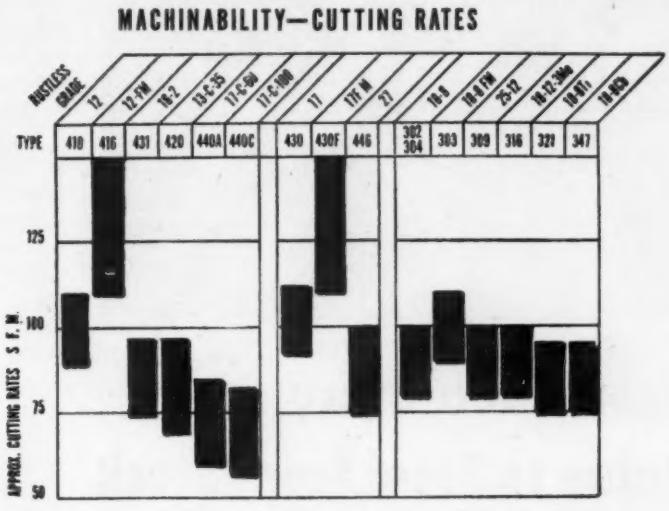
TIME STUDY AND MOTION ECONOMY—*By Robert Lee Morrow, consulting engineer and adjunct professor of administrative engineering, New York University. 338 pages. Published by The Ronald Press Co., New York. Price $5.00.*

This book is intended as a text for anyone interested in both the fundamentals and advanced techniques of time study and motion economy. It begins with the human problems that enter into any change in methods, discusses operation analysis and techniques, flow charts and suggestion plans, and then carries on into time study and its phases. Leveling and

RUSTLESS DATA SHEET NO. 6

Corrosion Resistance plus Machinability

One of the Many Combinations of Properties Offered by Stainless Steels



• Are Stainless Steels difficult to machine?

Thousands of production machine shops throughout the United States are making stainless steel products economically to production schedules. In these shops stainless steels are turned on automatic screw machines, single and multiple spindle automatics, turret lathes, and Swiss automatics . . . are milled, drilled, reamed, tapped and threaded. In many cases smooth finishes and close tolerances are mandatory. It is estimated that during the past year 130 to 150 million pounds of stainless steels were used exclusively in machining operations. At the present time more stainless steel bar stock is fabricated by machining than by all other methods combined. On a large scale, over a period of many years, actual experience has demonstrated that stainless steels can be machined easily and economically . . . that machining stainless steel is not difficult—only different.

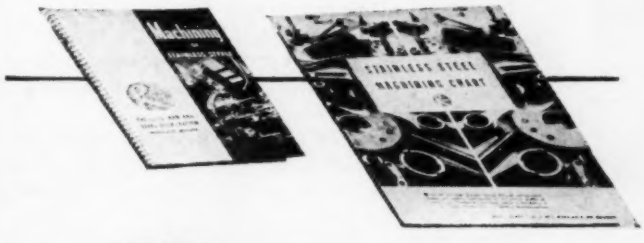
There are many grades of stainless steel, each designed for a particular combination of fabricating conditions and service requirements. All are machinable. However, when cutting rates are most important, it is advisable to take advantage of the free-cutting characteristics of the free-machining grades. Stainless steel types 416 (Rustless 12 FM), 430 F (Rustless 17 FM) and 303 (Rustless 18-8 FM) have been particularly adapted for machining operations by additions of free-cutting elements—sulphur, selenium, and phosphorous. The pronounced effect of these additions on cutting rates is clearly shown on the above chart. With the free-machining grades cutting rates approach 85% of those used on Bessemer screw stock.

In addition to good machinability, a variety of corrosive conditions may be successfully combated. Type 416 is used for ordinary corrosive conditions. Type 430 F provides excellent resistance against more strongly corrosive conditions. Type 303, the free-machining counterpart of 18-8 stainless, is used where superior heat and corrosion resistance is required.

Rustless specializes in stainless steels and over a period of years has made an extensive investigation of cutting rates, tool materials, lubricants, and the effects of special tooling for all grades and operations. This experience has proved extremely valuable to many engineers, metallurgists, and shopmen concerned with machining stainless steels. If you wish to know more about machining stainless steel . . . call on Rustless.

Write for Rustless' machining literature:

1. **Comprehensive Reference Booklet—84 pages**
2. **Chart of Condensed Machining Information—File Size or Wall Size**



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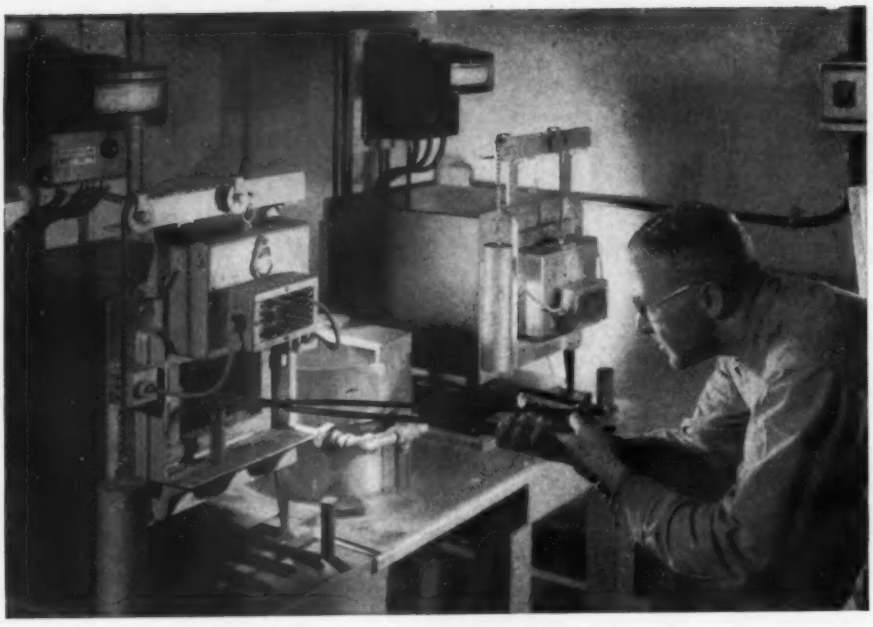
STAINLESS STEEL SPECIALISTS



Ryerson Laboratory Adds Extra Value to Steel from Stock

Steel from Ryerson means more than just steel from stock. It means that every heat has met exacting Ryerson specifications —based on more than 103 years of experience in the steel industry. It means that chemical analysis and physical properties are "as advertised" because Ryerson never stocks "seconds" or off heats. And often, it means steel made more valuable to you by the work of the Ryerson laboratory.

Whether you specify, buy or fabricate steel the laboratory serves you. There's no need for hit or miss heat treating when the laboratory runs Jominy hardenability tests on every heat of alloy in Ryerson stocks. Furnishes the results at no charge as a guide to heat treatment.

The laboratory also prevents uncertainty when definite specifications must be met. If carbon steel plates must not exceed a certain hardness limit, or if bars must have specified tensile strength, laboratory tests select the exact steel you need from Ryerson stocks.

These and other trouble-saving laboratory services point up two important reasons why more steel users call Ryerson: Persistent Ryerson effort to provide more complete, more practical service on steel from stock plus constant vigilance in maintaining high quality.

Because of the steel shortage many sizes still are missing from Ryerson stocks, but your size or a workable alternate may be available. Contact the nearest Ryerson plant when you need steel.

Joseph T. Ryerson & Son, Inc., Steel-Service Plants at: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

PRINCIPAL PRODUCTS

Bars • Structurals • Plates • Sheets • Mechanical Tubing • Safety Floor Plate • Alloys • Allegheny Stainless • Tool Steel • Boiler Tubes • Reinforcing Bars • Babbitt Metal • Bolts • Rivets • Metal Working Tools & Machinery, etc.

RYERSON STEEL

rating, synthetic leveling, fatigue, interruption and ratio-delay studies, the standard data method and other factors are discussed in detail.

The ways to study operations, take observations and compute the data are fully described. Administration of a time-study program is also treated with specific information on organization, personnel training and employee cooperation. Straight-line production, automatic-machine studies and recommended feeds and speeds for machining are discussed in their relation to time-study.

Besides its use as a text for courses in this field, the book should prove useful to executives interested in better methods, motion economies, elimination of excessive costs and installation of better controls over essential costs.

•

WORKSHOP TECHNOLOGY—*By W. A. J. Chapman, Ph.D., Principal, County Technical College, Stafford, England. Parts I and II, 303 and 328 pages respectively. Published by Edward Arnold & Co., London. Part I, $1.50. Part II, $2.50.*

Starting with the basic properties of metals, and iron in particular, the author shows how the whole science of metalworking has been developed. Considerable time is spent on the ever-necessary hand-craftsmanship required in the construction and maintenance of all machinery. The volumes are equally suitable as text for a shop-engineering course or for home study for apprentices and toolmakers alike. Besides covering the modern techniques of tooling, metal cutting, forming and joining, there is a large section which adequately treats the almost-lost art of blacksmithing — hand-forging and welding.

•

INSPECTION HANDBOOK FOR MANUAL METAL-ARC WELDING—*Published by the American Welding Society, 33 West 39th St., New York 18, N. Y. 156 pages. Price $1.50.*

The handbook is the emergency standard adopted in 1944 and is a complete and authoritative manual on welding inspection. It covers the requirements and duties of a welding inspector, welding term definitions, symbols, arc-welding procedure specifications, heat-treating and weldment defects. The section on weldment defects is extensive, covering defects under three classifications: dimen-

Engineered Hole Location Service

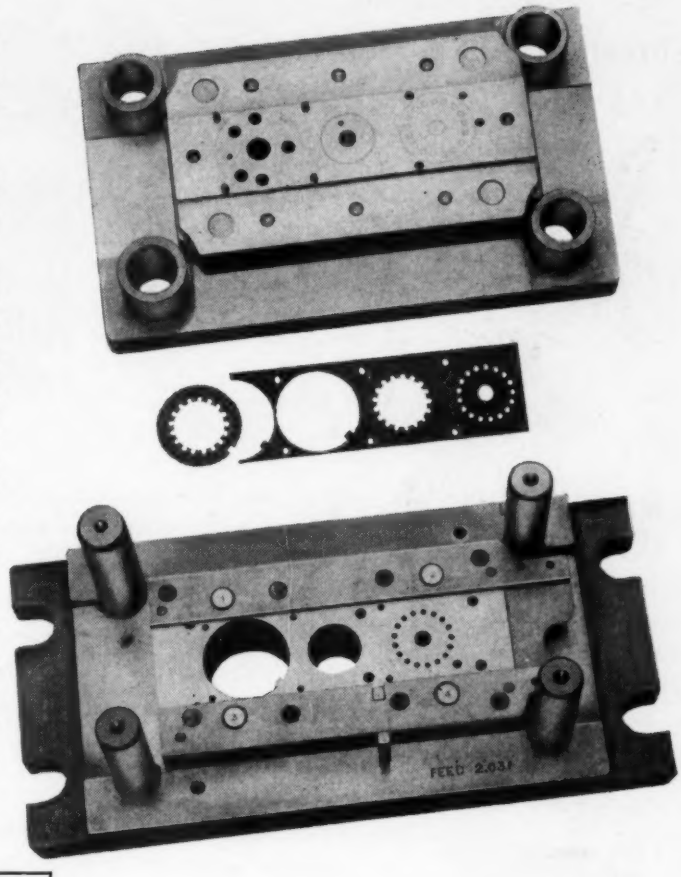
Prolongs Die Life

Electrical lamination stampings are tough on dies. With thin abrasive stock to be cut in enormous quantities, absolute uniformity in the small punch and die clearances is a "must."

Here's how the Moore Jig Borer and Moore Jig Grinder team up to pay dividends in your toolroom and assure 25% to 100% added die life:

Both machines work to pre-engineered dimensions, enable all parts of the die to be made *to figures instead of to "fit."* Coordinate calculations, set up in the engineering department, can be used throughout in boring the soft pieces in the Moore Jig Borer and finish-grinding the hardened parts in the Moore Jig Grinder. And all parts of the die can be made concurrently by several toolmakers on an *interchangeable parts-and-assembly basis* instead of progressively as a one-man job.

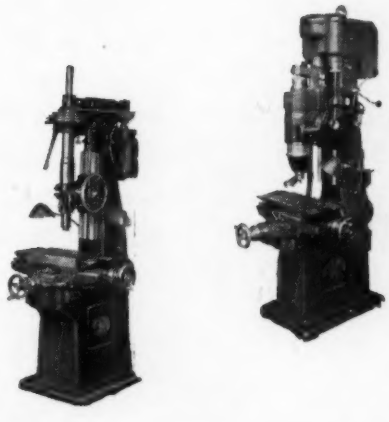
Consider how this Engineered Hole Location Service built around the Moore Jig Borer and Moore Jig Grinder can lower your tool costs . . . increase the capacity of the toolroom . . . speed new dies to your pressroom. Then ask a Moore engineer to stop by and answer your questions in detail.



Set includes six each of two sizes: 1" x 2" x 3" and 7/8" x 1-1/4" x 1-1/2".

This handy, compact set of Moore 3-Way Parallel Set-up Blocks takes the place of a large number of conventional parallels. Each block may be used in any of its three dimensions to build up to 12 different heights.

Spaced *around* the work-piece to provide support, parallel or perpendicular to working surfaces, they eliminate sagging, localize stresses and hold work rigidly throughout the machining operation. And they may be placed to avoid interference with holes being bored or ground. Write for descriptive literature.



MOORE JIG BORER

MOORE JIG GRINDER

MOORE TOOLS

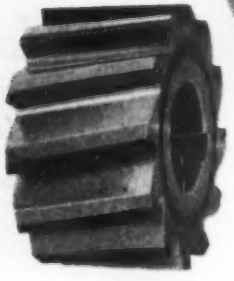
MOORE SPECIAL TOOL COMPANY, INC.

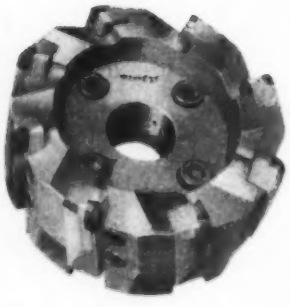
738 UNION AVENUE **BRIDGEPORT 7, CONN.**

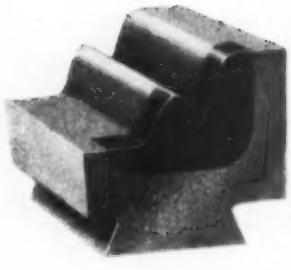
MIDWEST CARBIDE TIPPED METAL CUTTING TOOLS

Reduce Your Production Costs. Tell Us What Your Cutting Problem Involves. We'll Tell You How . . . .

MIDWEST's Induction Type Brazing Equipment — part of our modern, tool-producing facilities — speeds up brazing carbide tips to tools, assures a uniform and permanent bond.







LET us make a study of your particular metal cutting problems. Midwest engineers with a backing of 35 years experience in the design and application of metal cutting tools can assist you with them. Remember that efficient tooling means profitable production; inefficient tooling is a manufacturing expense.

Midwest designs and manufactures standard as well as highly-engineered, special application metal cutting tools. We can provide practical recommendations with respect to type of tools to employ and their application to your particular production jobs.

Write today for interesting, practical information, and bulletins on various types of Midwest Metal Cutting Tools.

Ask for a copy of Bulletin 1043—a 4-page, 2-color bulletin showing various types of Midwest Standard and Special Cutting Tools.

35th ANNIVERSARY YEAR 1911-1946

Midwest Tool

CARBIDE TIPPED TOOLS • MILLING CUTTERS • FORM TOOLS
COUNTERBORES • EXPANSION REAMERS • RECESSING TOOLS
CORE DRILLS • SLEEVES • ADJUSTABLE HOLDERS

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sional, structural discontinuities and defective properties.

Methods of testing and inspection of welds are given a comprehensive treatment. Chemical, metallographic and mechanical tests are described. Visual, magnetic-particle and radiographic inspection methods are discussed, with special emphasis on principle, procedure and application.

This book should be a definite aid o inspectors and serve as a reliable nstructive reference on basic fundanentals and advanced techniques of nspection.

•

INVOLUTOMETRY AND TRIGONOMETRY—*Computed and Compiled by Werner F. Vogel, Dr. Eng., Assoc. Prof. of Engineering, Wayne University, Detroit. 321 pages. Published by Michigan Tool Company. $20.*

Fundamental principles, definitions, and standardization of the nomenclature and mathematics used by gear-tool designers is the author's first objective. After clarifying these concepts with the aid of many excellent illustrations, he explains an entirely new system of involute tracing, layout and measurement, and to this end, has included a full set of entirely new mathematical tables of his own computation. Appendix B (55 pp.) contains standard gear data as adopted by American Gear Manufacturers' Association in descriptive and tabular form and included are many entirely new gear-design formulas.

•

POSTWAR TAXATION AND ECONOMIC PROGRESS—*By Harold M. Groves. A Research Study for the Committee for Economic Development. 432 pages. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. $4.50.*

This is a well organized discussion of the various types of taxation affecting the economy, and an exploration of means of encouraging industry via changes in the tax structure. Of particular interest to businessmen is the clear discussion of corporate taxes and incentive taxation, while its analysis of problems surrounding depreciation write-offs are also highly pertinent.

The author appraises the possibilities of incentive taxation, often cited as a means of leveling out industrial production, and examines various types of incentives, such as exemptions, refunds, discounts, premiums and credits. He concludes that one form of incentive taxation

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

Lo-swing IMP LATHE

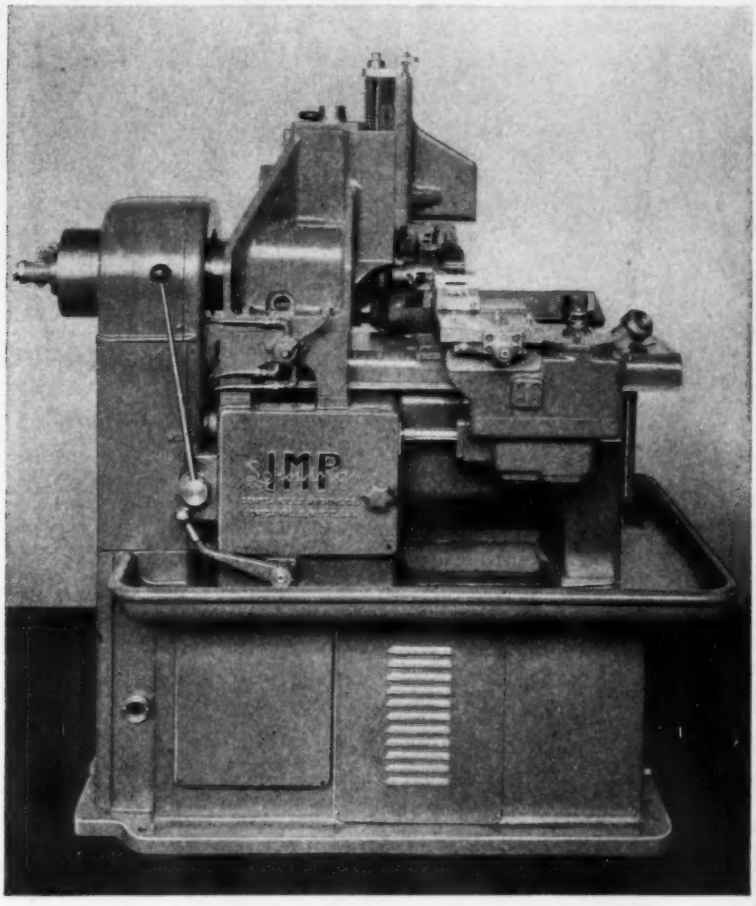
meets exacting demands on

SHOCK ABSORBER PART JOB

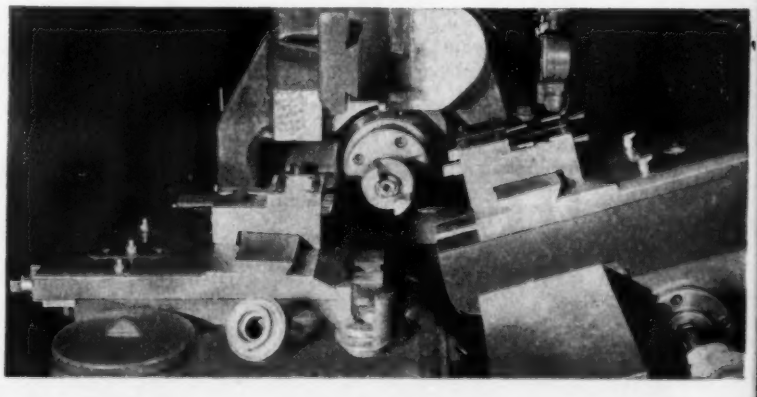
Problem: To finish turn various diameters and shoulders, and face both ends of a shock absorber part . . . to maintain a close degree of accuracy in volume production . . . to provide machines easily changed-over for other work.

Solution: Two *Lo-swing* IMP Lathes were selected for this job primarily because they provided the necessary speed, productive capacity and close accuracy demanded. By equipping these IMPS with standard Overhead Third Arms it was possible to avoid using complicated form tools (objectionable when cemented carbide used as in this case), and greatly simplify the tooling setup. The demand for flexibility was admirably met with the IMP'S inbuilt, fully-mechanical Quick Change-over Mechanism. This feature was particularly important to the purchaser . . . a manufacturer doing extensive contract work, who did not want to charge the machine investment entirely against this particular job.

As mentioned above, Cemented Carbide Tools were used to maintain high productive efficiency on these lathes.



As shown in the illustrations, the Front Carriage carries three tools which turn three diameters on the OD; a single tool on the Third Arm finishes a step on the part to very accurate limits; the Back Attachment, equipped with two tools, faces both ends of the piece. The work is held by an air-operated Draw Bar.



LATHE NEWS from SENECA FALLS

This WENDT-SONIS REAMER

- REGROUND 51 TIMES — STILL IN USE.
- AVERAGED 18 HOLES BETWEEN GRINDS — EXTRA HEAVY CUTS.

production data report . . .

NAME: Halliburton Oil Well Cementing Co., Halliburton, Okla.

WORK: Reaming hole 4½" in depth in 4130 steel—Rockwell C Hardness 41 to 43—on a radial drill.

TOOLS: 1. H.S.S. Reamer was used first and could not do the job satisfactorily.
2. Wendt-Sonis Carbide Reamer.

SPEED: 450 to 500 rpm.

FEED: .010.

RESULTS: 900 holes on 51 regrinds to average 18 holes between grinds.

Unretouched photograph of W-S carbide tipped spiral flute reamer. Still useable as long as carbide is left in flutes.

PERFORMANCE RECORDS like the one described above are ample proof that Wendt-Sonis Reamers help increase production . . . decrease costs. And, new developments continue to lengthen the service life of these reamers. Wendt-Sonis carbide-tipped reamers are made in a wide variety of sizes and styles — designed by one of the pioneers in the carbide tool field.

HELP ON YOUR CUTTING TOOL PROBLEMS is available through a nation-wide sales and service organization WENDT-SONIS CO., Hannibal, Missouri and 580 North Prairie Avenue, Hawthorne, Calif.

WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL BITS

"well worth trying" is the use of accelerated depreciation as a stimulant to small business.

A most significant point made in the concluding chapter is that "Taxes should preserve incentives. They should leave enough margin between the return to the ambitious, on the one hand, and the slothful, on the other, to make ambition definitely worth while. Particularly those who innovate and take responsibilities should not be singled out for adverse treatment by the tax system."

Other interesting portions of the book discuss the present tax discrimination against those with irregular income, the influence of state and local taxes on the general economy, the postwar federal budget, and the problem of selecting and applying a business tax.

•

THE TECHNIQUE OF JOB ANALYSIS AND EVALUATION—*By Charles S. Mattoon, director of industrial relations, The Wetherhead Co., Cleveland, Ohio. 135 pages. 8½ x 11 in.*

Issued as practical guide to job evaluation in the clerical, technical and administrative fields, this manual is offered free to management executives requesting it on company stationery.

Written for the purpose of enabling interested companies to install job evaluation with their own personnel, the manual offers the results of experience obtained in job-evaluation work over a period of 15 yr. It covers wage and salary administration, job analysis with sample reports, evaluation procedure, developing of wage scale and salary administration.

Job factors and degrees are defined, point values are given and labor grades are established. Seventy eight typical jobs are described and evaluated to show application of the plan.

•

JOB-EVALUATION METHODS—*By Charles Walter Lytle, professor of industrial engineering, New York University. 329 pages. Published by the Ronald Press Co., New York. Price $6.00.*

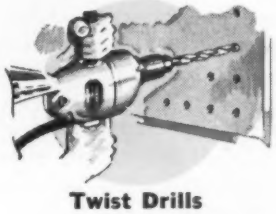
In this comprehensive book, the author has successfully treated job evaluation in an entirely different manner from that in the many other books on the subject. Instead of presenting one plan after another, he has separated job evaluation into its functions and resented the functions rather than plans.

This method of approach did not preclude, however, a complete treat-

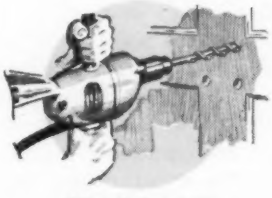
Handling Different Drilling Jobs Every Day?

HERE'S THE TOOL FOR YOU!

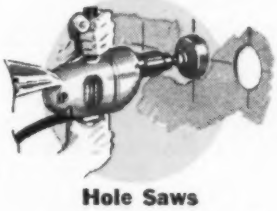
It Drives:



Twist Drills



Wood Augers



Hole Saws

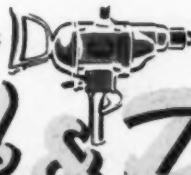
As Portable Drill

As Drill Press

THAT'S right! Whether you use the popular Black & Decker ½" STANDARD Electric Drill for production, assembly or maintenance operations . . . you're certain of top-notch work. It makes a versatile, general-purpose tool for hundreds of industrial drilling jobs. Its 400 R.P.M. spindle speed is ideal for driving twist drills up to ½" in steel . . . wood augers up to 1" in hardwood . . . Hole Saws for cutting clean, round holes up to 3½" diameter in any material a hacksaw will cut.

Moreover, the Black & Decker ½" STANDARD Drill is equally productive when used as a powerful drill press! Mounted in a Black & Decker Drill Stand, it has 6-to-1 leverage to put on the pressure when needed . . . a smooth, positive feed for more precise work . . . one-hand operation that makes it easier to guide the workpiece.

Check your nearby Black & Decker Distributor today on these versatile Drills. Due to the heavy demand, he may not always have them in stock. But he'll be glad to help you get them as quickly as possible. And for your copy of our complete catalog, write to: The Black & Decker Mfg. Co., 616 Pennsylvania Ave., Towson 4, Md.

LEADING DISTRIBUTORS  EVERYWHERE SELL

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THIS MAY BE NEWS to you ... You can get all the advantages of Laminum *plus* the sealing of oil and pressure in bearings ... in *babbitted* Laminum shims. The babbitt lugs are securely locked into the Laminum. Details on request.

Laminum shims are cut to your specifications. For maintenance work, however, shim materials are sold through industrial distributors.

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LAMINUM
THE SOLID SHIM THAT peels FOR ADJUSTMENT

ment of each method. Plans and techniques are described in detail as well as the fundamentals of wage policies. Job characteristics, measuring scales and job analysis are each treated thoroughly with many examples given to illustrate the practice in different companies.

Building the rate structure from the results of the evaluation procedure is covered by showing first, how the method of least squares is applied to determine the line of best fit and second, many illustrations of trend-line location and shape. Geometric progression in the wage structure is given consideration.

The application of job evaluation to office and supervisory positions is discussed as a special phase where additional factors are encountered.

•

TREATISE ON MILLING AND MILLING MACHINES, SECTION ONE — *Edited by Mario Martellotti. 182 pages. Published by The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. Price $1.*

This first volume discusses milling machines and accessories, cutters and cutter materials, and cutter sharpening. Starting with such basic information as defining the milling machine and describing the parts, it advances to such complex subjects as formulas for good tooth design.

The book is clearly written and at every point is well illustrated with photographs and drawings to help in following the discussion.

Of greatest value to students, the book is well-indexed so it can be used as a reference by engineers and production men. The milling examples which are given as typical, illustrating the fixture and chucking devices and discussing the most economical cycle of operations, will have a special appeal to many engineers.

•

RECOMMENDED PRACTICES FOR RESISTANCE WELDING *(Tentative)* — *Published by the American Welding Society, 33 West 39th St., New York 18, N. Y. 47 pages. Price $0.50.*

Here compiled are recommended practices for the spot and seam welding of steel, nickel, monel and inconel; projection welding of low-carbon and stainless steels; flash welding of forging steels; and testing of resistance welds.

Much of the information is presented in the form of tables and charts

JOHNSON BRONZE

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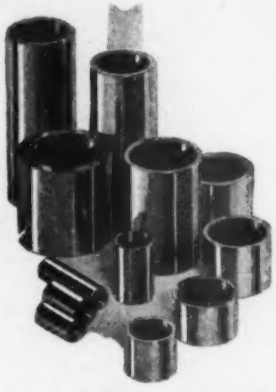

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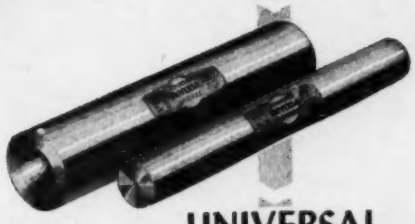
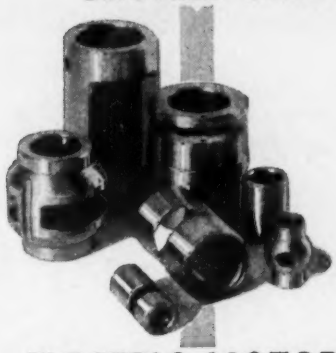
There is a complete Bronze Bearing Service as near as your telephone. Simply look in the classified section of your telephone book . . . under BRONZE. Select the name of your local Johnson Distributor. Then give him a call.

Johnson Distributors can quickly supply you with everything you need in Bearing Bronze. In bars they offer you a range of over 350 sizes. In stock size bronze bearings you can select any of over 850 sizes. Electric Motor bearings come in more then 250 individual types. Babbitt, Ledaloyl, (powder metallurgy) and graphited bronze are all available from *stock*. Every item in the line is the highest quality possible.

Why not call your local distributor—NOW? Give him the opportunity to demonstrate his exceptional service. The bronze will prove its quality through performance.



UNIVERSAL BRONZE BARS



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76 pages filled with interesting, informative data—fully illustrated. It's FREE.

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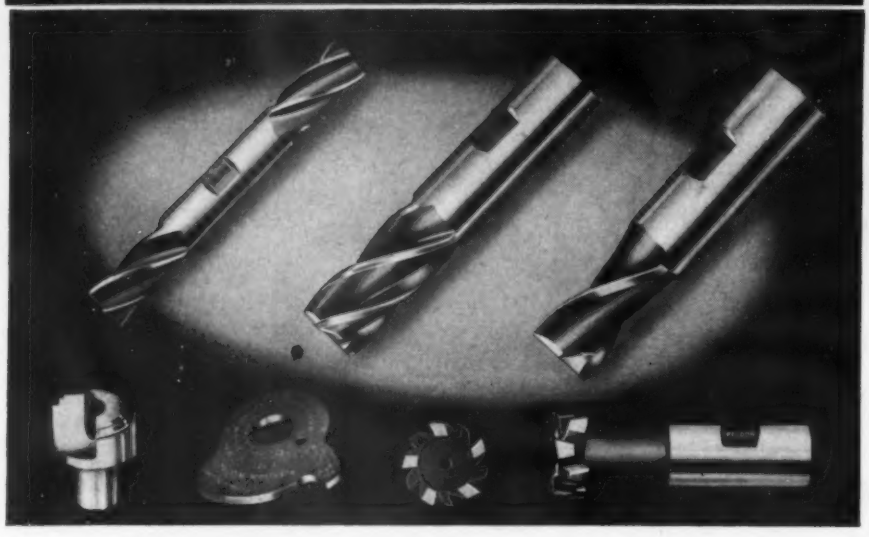


For HIGHER SPEEDS *and* FASTER FEEDS

The first real step in end mill improvement was made a quarter century ago when WELDON increased the spiral angle of the flutes to approximately 30 degrees—more than twice the previous angle.

This fast spiral angle . . . together with the hollow ground tooth and double backoff, also pioneered by WELDON . . . made possible much higher speeds and faster feeds—with greatly reduced tool breakage and job spoilage.

Insist on WELDON Tools for Well Done jobs.

Write for Catalog 8-B.

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

in an effort to include as much data as possible. The data was compiled by the A. W. S. Resistant Welding Committee by canvassing users of resistance welding processes. Tests were then conducted to determine if welds of specified strengths could be obtained.

The section on testing covers spot, roller-spot, seam and projection welds. Preparation of specimens and testing procedures are described fully. Also included is a section on the control of weld quality by statistical methods and control charts.

•

MATERIALS-HANDLING EQUIPMENT—*By Matthew W. Potts, consulting editor, Distribution Age. 172 pages. Published by the Pitman Publishing Corp., New York. Price $2.50.*

The importance of materials handling cannot be too highly stressed, so this book fills a need both as a textbook and as a reference manual. It covers the fundamentals of materials handling and the most widely used types of equipment.

No effort has been made to expand on any particular type. Rather it is directed to brief descriptions and common applications of standard equipment. Although many units of such equipment are used for any number of different operations, the author has limited the book intentionally in an effort to deal only with principles and fundamentals to make the book valuable at all times.

A worthwhile contribution to materials handling is made by strict adherence to correct names elimination of colloquialisms and a plea for standardized nomenclature which this industry so badly needs.

"Quotes"

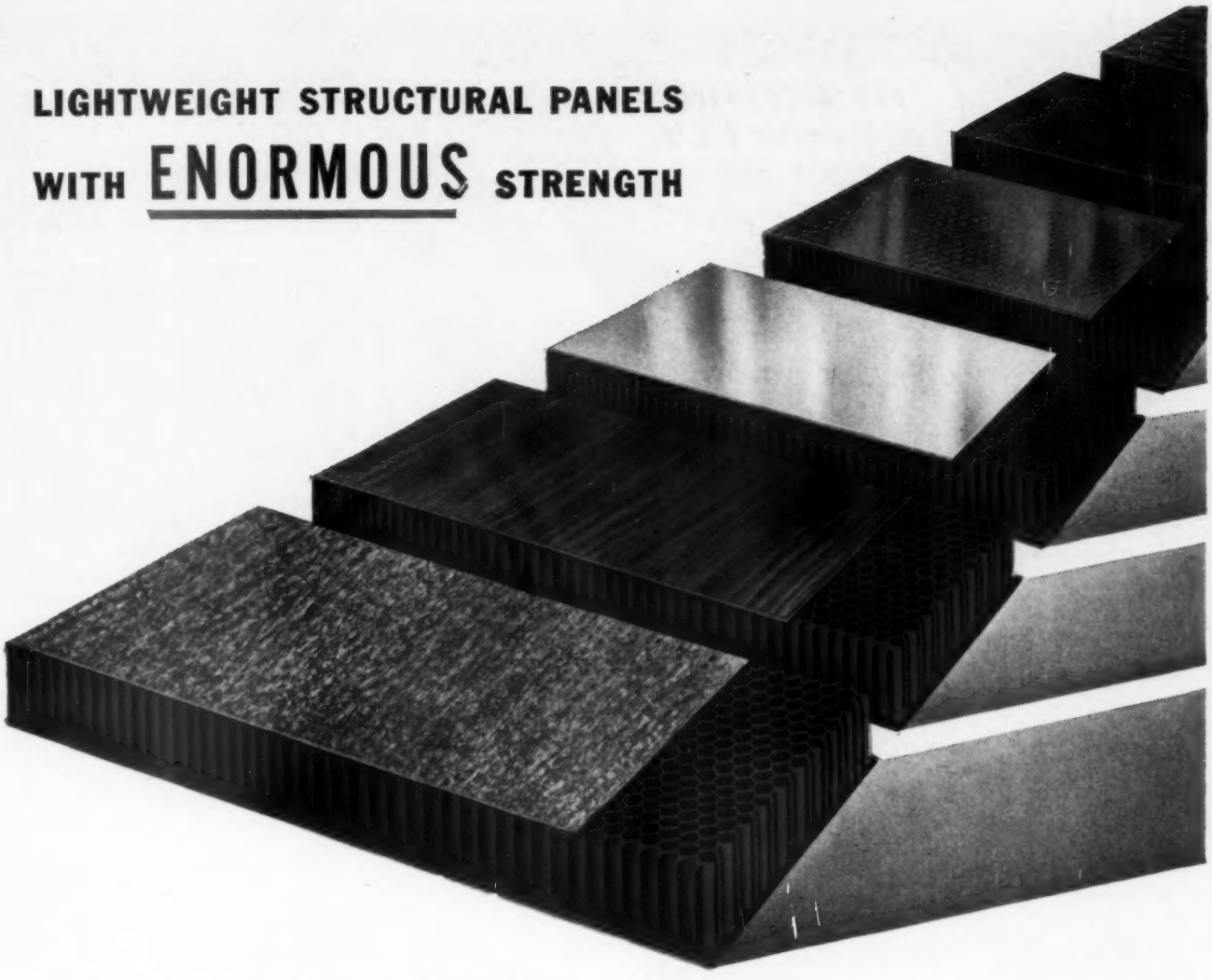
Non-Destructive Testing of Welds

In speaking before the American Industrial Radium and X-Ray Society, O. R. Carpenter of the Babcock & Wilcox Co., had this to say on advances in welding and radiography on welding of pressure vessels:

"1. Radiographic testing technique used today gives better results than earlier methods and at least one-half of 1% sensitivity may be expected under proper conditions.

2. Welding methods and our un-

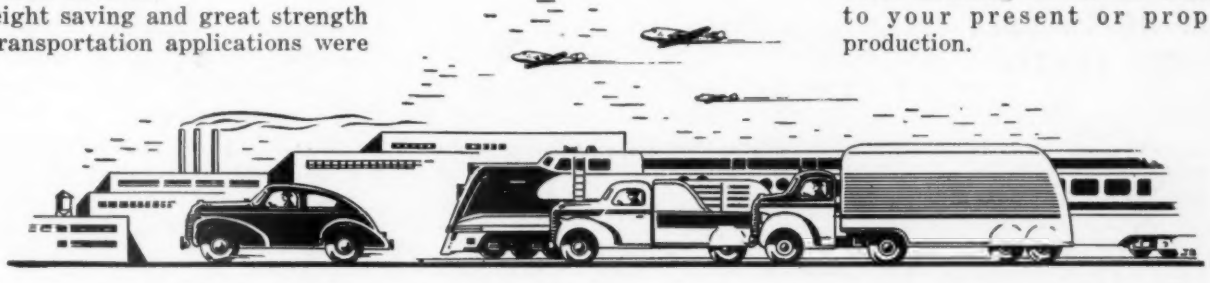
LIGHTWEIGHT STRUCTURAL PANELS WITH ENORMOUS STRENGTH



THE HIGHEST STRENGTH-WEIGHT RATIO of any structural material ever manufactured . . . that's the remarkable feature of this new plastic "honeycomb" laminate. Seeking a material that would decrease weight in airplanes, Glenn L. Martin Company and United States Plywood Corporation found the answer in a BAKELITE resin-impregnated cloth, paper, or glass cloth "honeycomb" core, bonded between thin sheets of aluminum, stainless steel, wood veneer, or plastic sheets. Comparative tests between 5-ply spruce plywood and the new "honeycomb" laminate, both ⅜-inch thick, show: spruce, weight lb. per square foot 1.012; ultimate load 875 lb.: laminate, weight lb. per square foot .573; ultimate load 1175 lb!

Weight saving and great strength for transportation applications were originally envisioned, but it is now evident that the new plastic "honeycomb" laminate will be widely adopted for hundreds of uses. To builders, product designers, engineers, and manufacturers, it offers a structural material that combines the unique properties of BAKELITE plastics with the opportunity to improve products and attain faster, more economical production.

As currently produced by United States Plywood Corporation, plastic "honeycomb" laminates are available with cores varying in thickness from ¼ in. to 2 in. The laminated panels are produced in a range of dimensions up to 5 ft. by 10 ft. Write Department 34 for further data to help you apply these amazing structural materials to your present or proposed production.



BAKELITE PLASTICS

TRADE-MARK

BAKELITE CORPORATION, *Unit of Union Carbide and Carbon Corporation* UCC 30 EAST 42ND STREET, NEW YORK 17, N.Y.

FOR ACCURATELY MEASURING I.D.'S OF SLOTS AND KEYWAYS
HEAD CAN BE CENTERED FOR PROPER "FEEL"
EACH MEASURING ROD IS ADJUSTABLE FOR LENGTH
LUFKIN INSIDE MICROMETERS
Lufkin Inside Micrometers simplify the job of accurately measuring finished I.D.'s of holes, slots, and keyways. Extension rods are added to either end of micrometer head as needed, thus permitting the workman to keep head centered for perfect balance and feel and easy reading. Micrometer head will measure down as small as 1½". Write for free catalog.
BUY THROUGH YOUR DISTRIBUTOR
LUFKIN
The Lufkin Rule Co., Saginaw, Michigan, New York City.

derstanding of welding problems have so improved pressure vessel welding that gross defects in welds such as slag and porosity are today relatively uncommon.

3. The most troublesome type defect found in arc welds of pressure vessels today is one resulting from plate conditions which may be called segregations or inclusions and which contain sulphides. The encountering of these by the welding arc and the heat of welding results in serious defects along the line of fusion of the welds. These are disclosed by radiographic testing.

4. A long search for methods for determination of plate quality with respect to the segregation condition described has not given results until the recently developed Reflectoscope became available.

5. The Sperry Reflectoscope gives promise of providing a non-destructive means for studying plates along their welding edges prior to welding and making possible a selection of those which will weld satisfactorily because of the presence of an allowable distribution of segregations and inclusions.

6. Much work remains to be done in the study of the Reflectoscope for this application. Results so far indicate that for plates of thickness in excess of 1¼ in. the wave diagrams obtained may easily be classified as ones resulting from segregations which will or will not cause trouble in welding. Thinner plates require more study and work now under way will indicate what success may be expected in this range of thickness."

•

Self-Locking Nuts

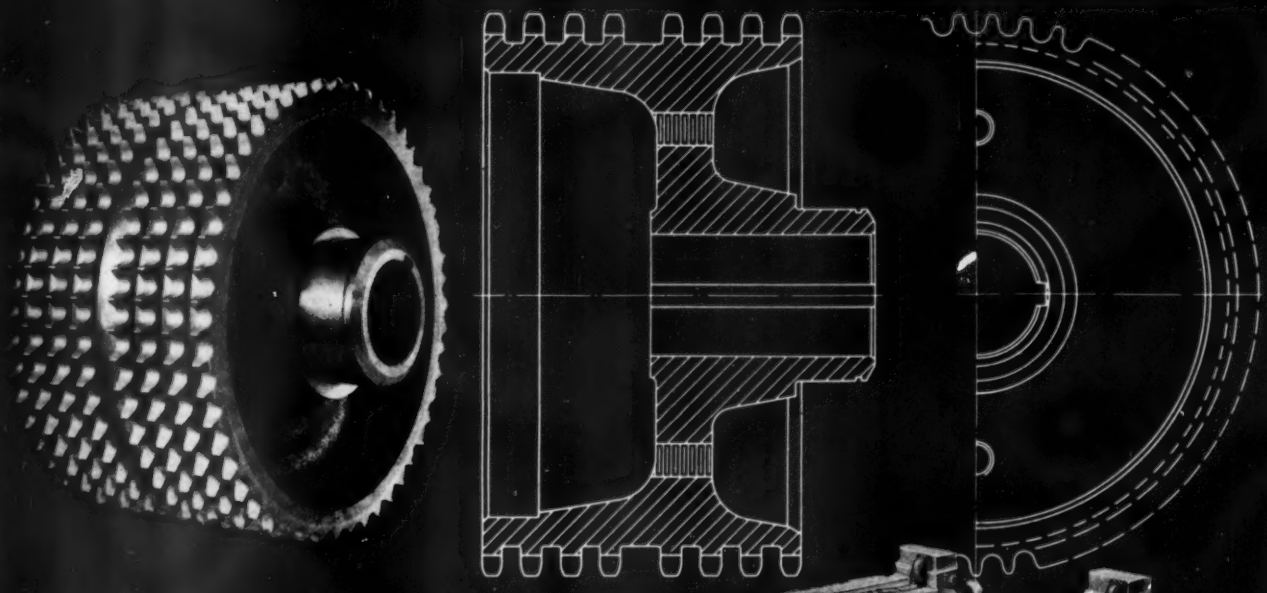
W. E. Horenburger, chief service engineer of Elastic Stop Nut Corp., stressed the following facts on self-locking nuts in his paper presented at the semi-annual meeting in Detroit of the American Society of Mechanical Engineers:

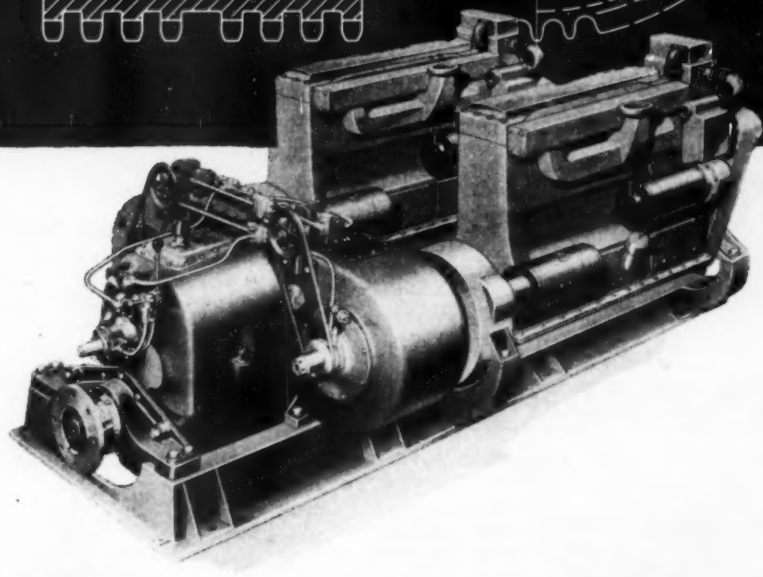
"With labor costs rising, and productivity decreasing, manufacturers of industrial equipment are more and more dependent for their customer acceptance upon the ability of their equipment to stand up under the rigors of continuous operation. Operators of this equipment, particularly the process industries, rise or fall on their ability to maintain uninterrupted production. Any device which will contribute towards the elimination of down time, due to mechanical difficulties, becomes a virtual necessity. The self-locking nut is such a device. . . .

"Vibration resistance is the prime

SPECIFIED

MAIN SPROCKET		DATE 10-13-44
MATERIAL **MEEHANITE** TYPE "GA"	HARDNESS 200-220 BRINELL	SCALE FULL SIZE
		DRAWN P.T.B.
		CHECK JH
TWIN DISC CLUTCH CO. RACINE, WISCONSIN		APPROVED Leuf





ABOVE: Meehanite main sprocket used in propulsion assembly.

RIGHT: Twin Disc Model ME-300 multiple engine single screw unit in which Meehanite sprockets are specified.

When designing their Model ME-300 multiple engine hydraulic drive unit for single screw marine propulsion, Twin Disc Clutch Co., Racine, Wisconsin, specified Meehanite sprockets for the roller chain drives. The importance of these sprockets from the standpoint of performance, resistance to wear, strength and toughness, is obvious in units of this type. Meehanite meets the requirements.

All sprockets have cut teeth and the machining of a part of this type provides tangible evidence of casting uniformity, solidity, freedom from defects and good machinability.

Write for Bulletin No. 20 entitled "Meehanite—the Metal for Wear Resisting Castings."

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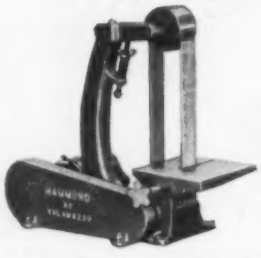

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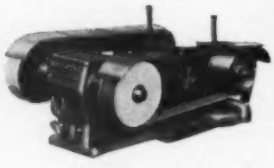

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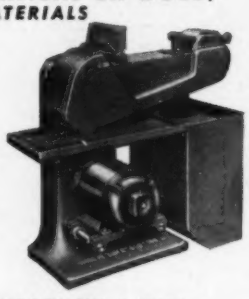
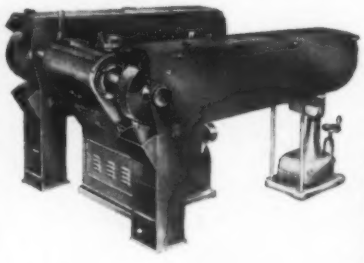


MODEL VH-6 WET-n-DRI, 6" BELTS — Vertical or Horizontal position. Other machines for up to 10" belts.



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reason for the existence of self-locking nuts. Tests were developed to measure the ability of a nut to maintain its predetermined position under all conditions of vibration and impact loads without affecting its other qualities. A standard testing mechanism was specified as the basis for comparison. It might be interesting, from a standpoint of relative performance, to compare the locking properties of conventional fasteners, as measured by such a device, with a non-metallic locking insert type of self-locking nut. These tests were conducted by the U. S. Naval Engineering Experiment Station, and it reported the relative locking power of the various devices, as determined by the number of blows required for a steam hammer to loosen the nuts, as follows:

Standard Nuts	1.0
Standard Nuts with half jam nuts	1.3
Standard Nuts with lock washers	2.1
Nut, with non-metallic locking insert	7.2
Nuts, non-metalic insert on finished bolt	115.6

"This test also served to highlight the importance of bolt finish and overall quality to locking power. Where the non-metallic insert lock nut was used with a bolt of aircraft finish and quality, the locking effect was 16 times that of the same nut on a commercial bolt. Such an advantage only devolves to a nut with non-metallic insert, for no such comparable increase was noted with other types of locking devices.

"From the standpoint of the general industrial engineer, no specifications exist in the files of the various technical societies detailing the performance requirements a self-locking nut must meet. The interested engineer has a choice of reviewing the Army-Navy aircraft standards (AN-N-5) and relating them to his problem, or developing his own standards conforming to those to be developed by manufacturers of self-locking nuts. The most desirable course would be the establishment of his own standards. In this way, proper consideration could be given to any special requirements peculiar to his organization's fastening problem, and conflicting claims made for various nuts could be resolved on a common plane. Recognizing the limitations of a particular style of nut as previously outlined, a series of simple standard tests and qualifications would be established to enable the user to select the bolt-and-nut combination best suited to

his particular application. The recommended tests include:

1. Vibration test
2. Installation and removal test
3. Repeated application under load
4. Wear and plating tests
5. Tests for special characteristics

"Information necessary to develop detailed test procedure may be obtained from the leading manufacturers of self-locking nuts or reference may be made to the aircraft specifications. It is the tests for special characteristics that call for the greatest amount of engineering judgment. The nuts in question should be studied to determine whether or not they possess any special features which may be of advantage in the particular application involved. The effects of humidity or atmospheric corrosion are often neglected, only to find after a period of service the fastener cannot be disassembled because of rusting threads. Similarly, where the service temperature is beyond the normal capability of the locking device used, that fact should be given consideration."

Steels for the Immediate Future

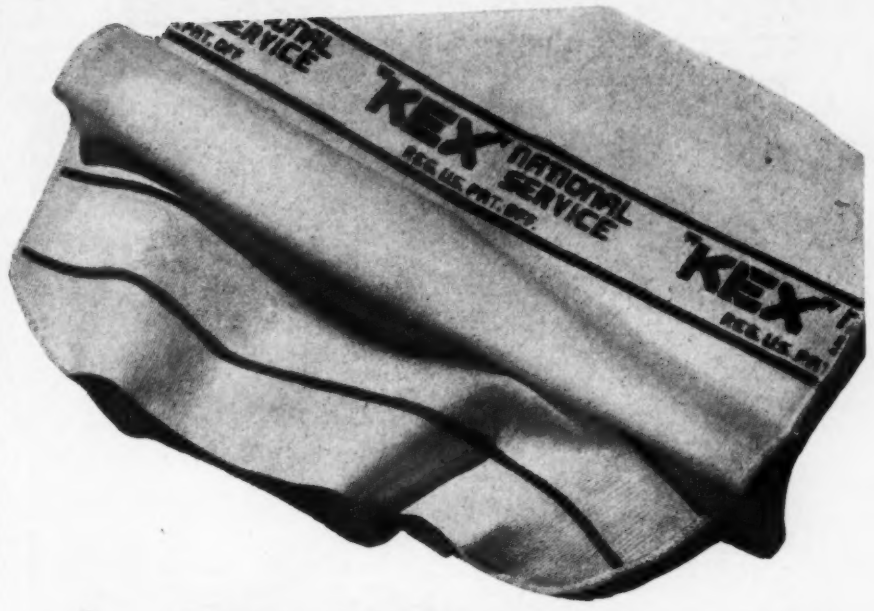
BY MAURICE N. LANDIS
MANAGER OF METALLURGICAL & RESEARCH DIVISIONS
LaSALLE STEEL COMPANY

Steel specifications of the future are difficult to predict. This is my opinion, gained from talking both to the steel producers and to the steel users, who actually, by their demands, determine the grades.

First, all appearances indicate that the AISI system of naming of steels will be followed in the future. The SAE has now adopted the AISI system except for the prefix letter. We believe this prefix letter fulfills a need in that it symbolizes the method of steel manufacture or general class of the steel such as "B" for Bessemer manufacture, "A" for alloy, "C" for carbon steels and "E" for electric furnace.

Our opinion of the most popular and most available of the generally used steels is as follows:

In the carbon steels, we anticipate that the various grades will go along as they are now, except that C-1042 is fast replacing C-1040 and C-1045 as the medium-carbon shafting steel. The C-1042 is identical to C-1040 and C-1045 except for carbon which is 0.40% to 0.47%. 1020-90 (C-1019) probably will continue to be the generally used lower-carbon shafting and carburizing steel. Also C-1050 is being employed where good hardenability



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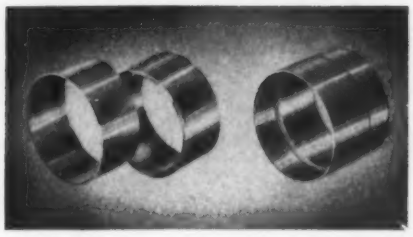

Laboratories that in peace as in war are pacing the advance of American industry demand accuracy above everything else. It is no wonder, then, that one of the largest laboratories in America came to Ace for these pressure support rings.

Here is a job that calls for exceptionally fine tolerances. The thin-walled ring had to fit snugly over the thick-walled ring—a free fit . . . but not loose. Not only was it necessary to hold close tolerances for size, but also for accurate concentricity. From the selection of special steel bar stock, through the machining, heat treating, grinding, and inspection operations, this was a typical Ace precision job.

Such jobs are merely a part of the daily grind at Ace, where accuracy applied to mass production was pioneered. Management skill and modern equipment are turning out tolerances as close as .0002" (which makes paper seem mattress-thick) and finishes which a speck of dust or a warm hand distorts.

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is more and more a vital factor.

In screw steels B-1112 will continue to be the basic free machining steel with B-1113 being used more and more when screw machines are able to take advantage of its superior machinability.

Little change is seen in the open-hearth free-machining steels. C-1117 (the former X-1314) should continue to lead for those applications where ready machining and open-hearth quality are required. C-1137 (formerly X-1335) is still a popular quenching, free machining steel, although a modified C-1144 is rapidly becoming popular where excellent machinability, superior to that of C-1137, and hardenability are requirements.

In regard to alloy steels, the picture is not so clear. The 8600 series seems definitely to be in, especially A-8640 and A-8617 for quenching and carburizing, respectively. Also, some A-4140 is being specified and produced as well as a little A-3140. There is not much 3115, 3120 or 4120 being used now for carburizing, though the grades are sometimes available.

Actually, the 8600 series worked well during the war, performing fully as well as the older alloys. Further, the scrap situation is certain to make these ternary alloys attractive to producers.

Other higher-alloyed steels are certain to be used for those applications which actually require them. Thus A-4615, A-4640 and either A-4340 or E-4340 are almost indispensable at times. In this connection the 4300 series has met a lot of critical situations in the aircraft industry with success. We do not believe, however, that these high alloys will be as indiscriminately specified as they sometimes were in the past. Many designers have learned that the less-expensive leaner alloys are fully adequate for most jobs.

Another factor which is going to influence future steels is the constant pressure to reduce costs. Thus, if a refinement of heat-treating technique makes it possible for a shop to use carbon steel instead of alloy, a change is made to carbon. But the same refinements might make it possible to mass quench alloy steels where individual quenching of carbon is required, with the change then to alloy. Along this line, the widespread adoption of induction hardening is causing a major shift from the carburizing steels, both carbon and alloy, to steels of approximately 0.50% carbon.

The use of sulphur to enchance machinability of alloy is rapidly gaining ground and should continue. Previously, when raw sulphur was added,

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there was serious doubt among many metallurgists as to the quality of the steel produced. With the introduction of the sodium bi-sulphite process such doubts have largely been eliminated, so that we can now say these alloys are quality steels with markedly enhanced machinability. This is especially pertinent in the heat-treated bar steels (8640) where considerable machinability has heretofore necessarily been sacrificed to produce a strong, tough steel.

PRODUCTION SERIES BULLETINS—*Published by the American Management Association, 330 West 42nd St., New York 18, N. Y., from papers presented at production conferences held in the last 2 yrs.*

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These bulletins will prove of great value to any executive, representing as they do the experience and knowledge of such nationally recognized authorities as Ralph M. Barnes, James F. Lincoln, George S. Dively, L. Clayton Hill and R. W. Mallick.

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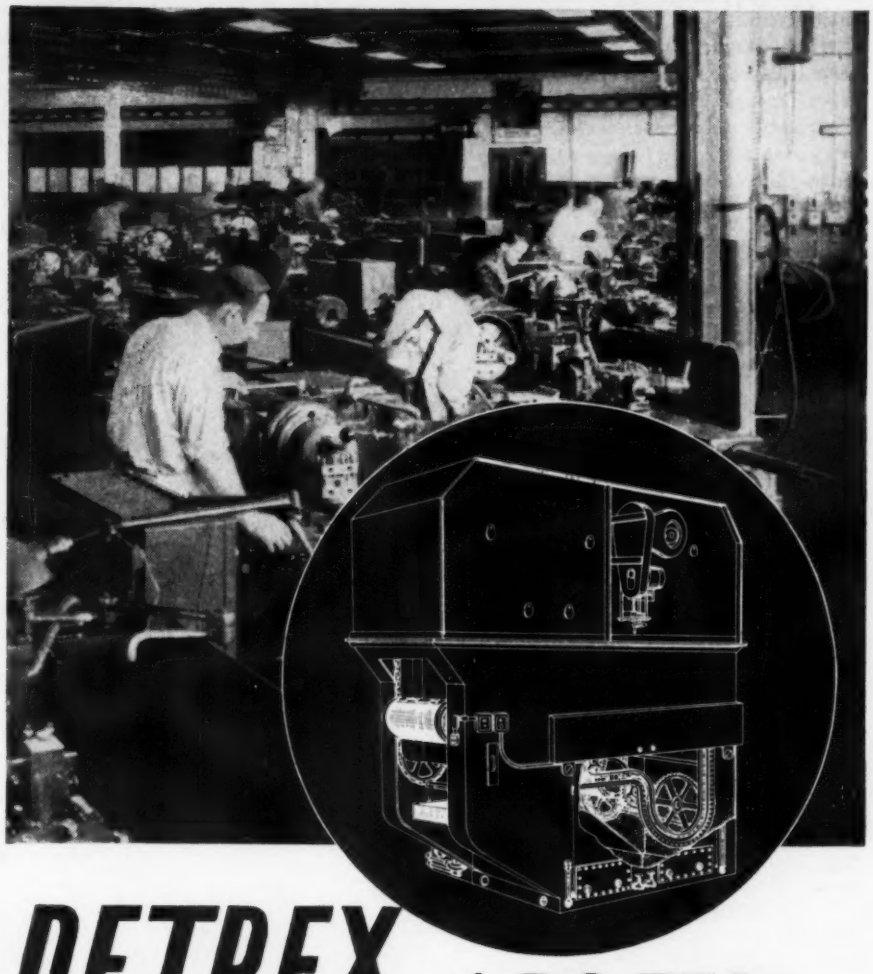

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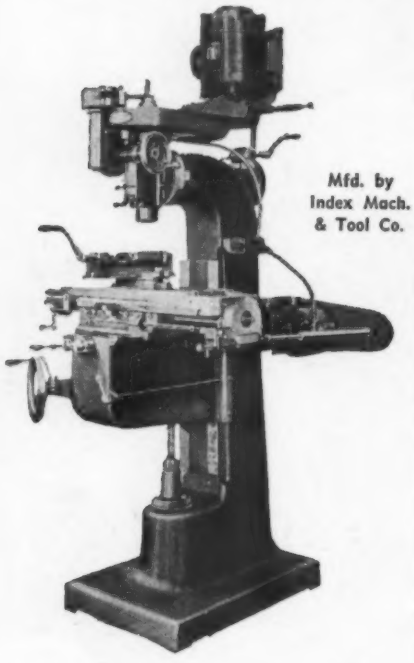

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Can the Patent Decline Be Checked?

BY MYRON F. HILL

SINCE 1930, the number of patent applications has steadily declined, and the chances are that they will continue to do so. Indications are that the major reason for this trend is the inadequate protection now provided for independent inventors.

Many inventors are now saying: "No more invention for me. If I make an invention and show it to a corporation, the corporation grabs it. Without money to fight, I'd lose the invention."

The writer showed an invention to a prominent chemical company and had an eight-year fight in the courts on his hands. Trained in patent law, he succeeded in defending himself. Another without such training might have lost his invention if unable to afford the hiring of a lawyer and the prolonged litigation.

Herbest invented "expanded metal," used by hundreds of thousands of tons in houses and hidden airports in foreign lands. After working in devising machinery to make expanded metal, he lost the enterprise to smart legal tactics, and has nothing to show for his work. With a mind teeming with valuable ideas, he swears never again to work on an invention.

Thefts of inventions by corporations or individuals are never talked about. Even courts do not listen to such charges. Attorneys sidestep such issues on behalf of their clients, preferring to present the facts of their cases without comment. If the judges see what has happened, they are not eager to inform district attorneys. The result is that the major legal issue is general "priority" of invention, and not whether one of the claimants has stolen the idea from the other. The situation obviously encourages attempts to steal inventions, and bids fair to further reduce the efforts of independent inventors, from whom the bulk of inventions come.

Although the public is the chief gainer from inventions, it does not display active interest in protecting inventors either through lack of knowledge of patents and the conditions surrounding their issuance and legal protection, or because of lack of organization of a movement to stimulate invention.

It is not the corporation inventor who needs such assistance and protection, since his inventions automatically become the property of his employer. But this help is need-

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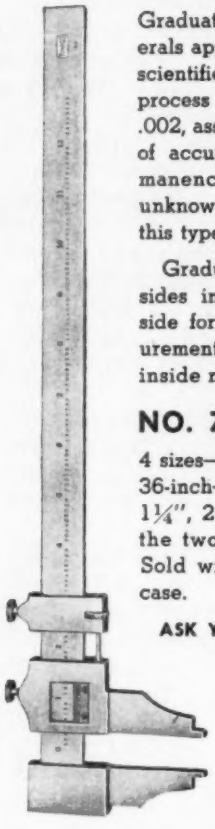

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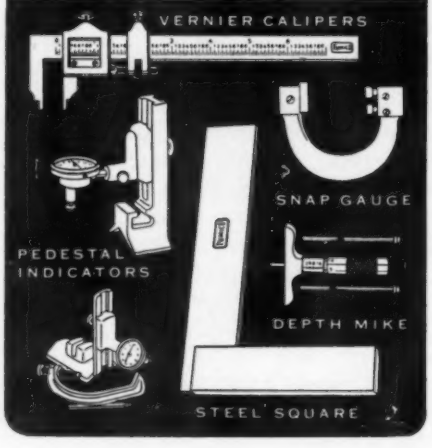

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The rapidly expanding market for stainless steel products has called for the production of many types of stainless steel bars.

Midvale's long years of experience in manufacturing fine bar steels has proved to be of inestimable value, particularly when meeting requirements for special types about which little was previously known.

Midvaloy stainless steel bars regularly produced include all the usual types in the three principal groups—Chromium Nickel, Non-Hardenable Straight Chromium and Hardenable Straight Chromium—as well as many special types for special purposes.

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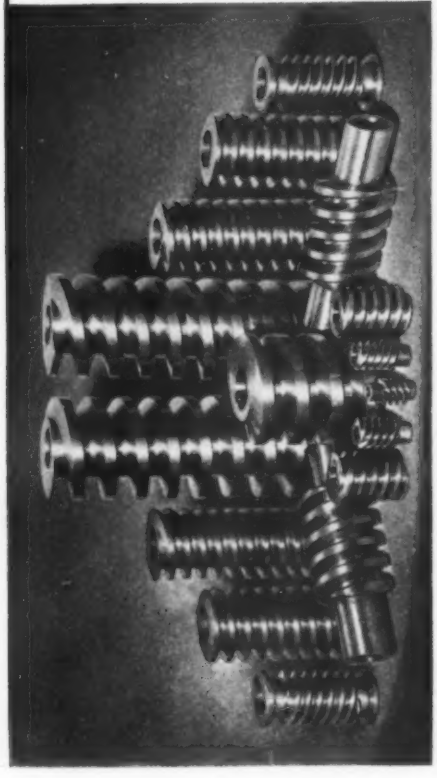

ed by the inventor who has to go it alone. His greatest need is the service of a good attorney to guide him in securing patents and in arriving at contracts for the disposal of the invention. Although there is an Inventor's Council in the Patent Office in Washington, such services should be available to inventors free of charge. The public funds spent in helping inventors would be a mere bagatelle compared with the general gain that will result from more inventions.

The second need is adequate courts to pass on patent matters. At present, many patents are declared invalid by the courts, which places their judgment at variance with that of the patent examiner, or else indicates that the Patent Office has failed to do its work correctly. Due to his scientific and mechanical training, an examiner can immediately understand the value of an invention, but a lay judge rarely has such training and is usually unable to grasp the ins and outs of a case as well as an examiner. Nevertheless, we spend money on examiners to examine patent applications and grant patents, and we spend more money on courts and lay judges who declare most of the patents in litigation invalid.

A remedy for this folly would be a patent court made up of judges with scientific and mechanical training, specializing in patent law, thus enabling them to understand and protect inventions. Perhaps most decisions invalidating patents would not be made by such trained judges.

Going beyond this, there is a need for a supreme court of patent appeals made up of such trained judges to stabilize the law in view of varying decisions in different courts. If such a court were not available, it would probably be overwhelmed with appeals on patent decisions from present Federal Courts. In view of this, it would also be necessary to have lower patent courts, staffed by judges qualified in patent law and mechanical and scientific terminology, to handle initial patent cases. We have had Customs Courts in which a judge holds court in different sections of the country, and this system could be applied to federal patent courts.

Only such actions would (1) protect independent inventors with slim funds from the pirating of their ideas, and from litigation charging them with infringing on the rights of others; (2) help to reduce the time required by courts at present to handle patent cases; (3) assure a fair decision in all patent cases.

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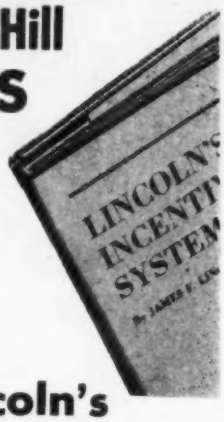

Lincoln's Incentive System

By James F. Lincoln, 192 pages, 5½ x 8½, $2.00. Brings together the fundamentals and methods of application of the incentive plan of management, and the history of its use in the Lincoln Electric Company, where it increased output per man per year more than twelve times. May be applied in all activities which require cooperative action by a number of people. This presentation demonstrates the practicality of the cooperative system, and illustrates the details of its practical use.

Job Evaluation and Employee Rating

By Richard C. Smyth and Matthew J. Murphy, 225 pages, 5½ x 8½, $2.75. Points out the current status of job evaluation and merit rating as effective tools of management, following the same sequence in presenting the subject as would be used in actually installing and maintaining a program of job evaluation and merit rating. It analyzes the types of plans currently in use and shows how to establish and administer a system which will function smoothly.

Management Can Be Human

By Harvey Stowers, 131 pages, 5½ x 8½, $1.50. Presents commonsense advice for establishing better human relations between management and workers, thereby reducing production costs and raising quality of work. Shows what conditions make for harmony, team power, and fine production, and what makes for discord, hatred, and bitterness in business; gives numerous practical, simple and time-tested principles which can and will bring about better relationships between supervision and employees.

Time Study Engineering

By William H. Schutt, 500 pages, 6 x 9, $5.00. Simply and understandably covers every detailed phase of time study on the basis of specific machine studies. Every time study shown is from an actual observation from some industry and is actually being used. In presenting various problems, the book analyzes them carefully and then shows how to work each one out.

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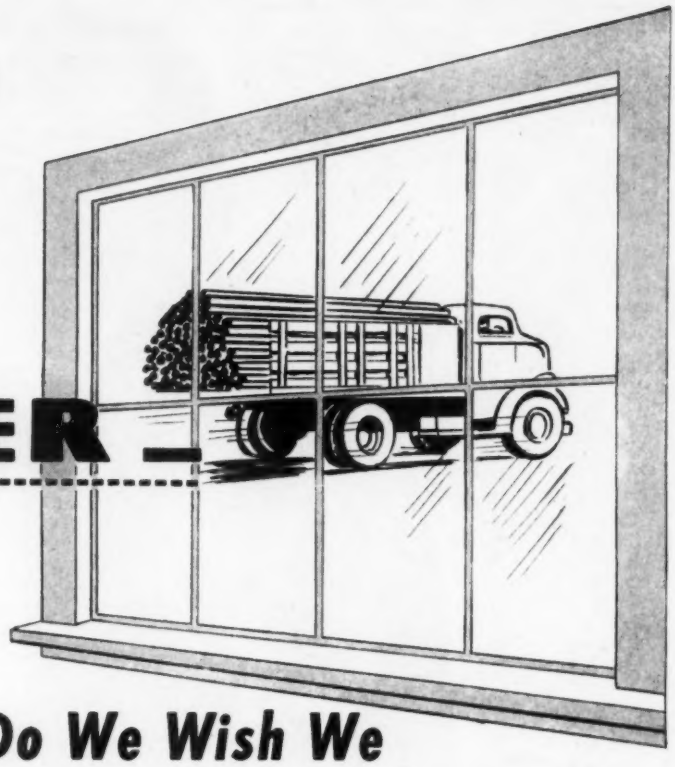

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SO . . . why do we continue to advertise? Well, we talked it all over and it's like this. Present conditions CAN'T last and fast machining, excellent carburizing Speed Case Steel is so outstanding in solving so many and varied production problems, encountered when using B1112, B1113, C1117, C1118, C1019, etc., that we want you to continue finding out about it.

We want you to ask for our Brochure which tells the whole story of this revolutionary steel, with actual case histories.

We invite you to ask for the services of our Speed Case Production expert. He will visit you, after samples have been provided you, and show you how to set up your tools for faster and more successful production with Speed Case x1515 Steel.

. . . it is worth waiting for!

ACTUAL PHOTOGRAPH

Speed Case Steel (.20 carbon) 1 inch cold drawn bar tied in a knot, cold, without fracture.

Tear this off . . . **ATTACH TO YOUR LETTERHEAD AND MAIL TO EITHER COMPANY BELOW**

Licensee for Eastern States

THE FITZSIMONS COMPANY

YOUNGSTOWN, OHIO

MANUFACTURERS OF A COMPLETE LINE OF COLD FINISHED CARBON AND ALLOY STEEL BARS

Licensor

MONARCH STEEL COMPANY

HAMMOND · INDIANAPOLIS · CHICAGO

PECKOVER'S LTD., Toronto, Canadian Distributor

Want to

THE STAKES . . .

A Box of
Corona-Coronas,

A Couple of White
Broadcloth Shirts, or
. . . don't make it too stiff!

THE BET . . .

That, if you agree to give one of our Carilloy specialists the opportunity of cooperating with your metallurgical and shop people, he will be able to recommend changes in your utilization of alloy steel which will either:

(a) Improve your product without adding to its cost, or
(b) Make possible important savings in production cost, without impairing quality or performance. And that, if he fails to make good on one or the other of these points . . . we lose, and you collect.

CARNEGIE-ILLINOIS STEEL CORPORATION
Pittsburgh and Chicago
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York

UNITED STATES

make a Bet?

WHY WE'RE PRETTY SURE OF OURSELVES . . .

(a) Because, in most cases where our Carilloy specialists have been invited to analyze a manufacturer's metallurgical problems, they have been able to suggest changes in alloy steel specifications or in shop procedure which saved the customer thousands of dollars annually.

(b) Because the personal knowledge of our specialists is backed by the most progressive alloy research program in industry . . . and by an unexcelled reservoir of metallurgical experience.

(c) Because no other steel producer can match our versatility of production facilities and variety of products.

LET'S GET TOGETHER — *We would welcome an opportunity to help you improve your utilization of alloy steels. A letter from you will bring a U·S·S Carilloy Specialist to your plant, equipped with the latest metallurgical information.*

U·S·S
Carilloy Steels
ALLOY STEELS FOR THE SPECIAL JOBS OF INDUSTRY

USS STEEL
UNITED STATES STEEL

S T E E L

Here's one more way

McCASKEY TOOL CRIB CONTROL REDUCES PRODUCTION COSTS

The McCaskey System definitely records employees' responsibility for tools. No time-wasting disputes occur when tools are turned in or employees quit. As a result, production delays and the loss or theft of tools are practically eliminated.

Here's a case in point, taken from the statement of a well-known plant using McCaskey Control:

Under the old system, the cost of the cutting tools, gages, micrometers and other tools that were lost, strayed or stolen each year amounted to a considerable sum. Under the present system (McCaskey), the loss of a tool is very rare indeed.

The crib attendant knows where each tool is and can locate it instantly. Thus the arguments that wasted time, delayed production and ruined otherwise good dispositions in days of yore have been completely eliminated.

This is only one of numerous advantages of McCaskey Tool Crib Control that effect substantial reductions in tool expense and contribute to lower over-all production costs.

Let us have a representative explain how McCaskey Tool Control will pay for itself in a few weeks . . . or send you factual reports on McCaskey savings in several well-known plants.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

FREE LITERATURE

New Catalogs, Booklets, Bulletins

MACHINES AND ATTACHMENTS

1 THREAD GRINDING—Landis Machine Co., Waynesboro, Pa. New 8-page monthly bulletin "Landis Thread Tips" describes developments in thread cutting. First issue gives much information on the centerless thread grinder.

2 RIVETING MACHINES—The H. P. Townsend Manufacturing Co., Hartford 1, Conn. 6-page bulletin describes line of riveting machines, with illustrations and specifications. Machines are available for almost every type of riveting process.

3 BORING ATTACHMENTS — Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. 46-page bulletin covers accessories and attachments for horizontal boring, drilling, and milling machines that are intended to simplify difficult jobs, increase production, and lower machining costs.

4 BROACHING MACHINE—The Lapointe Machine Tool Co., Hudson, Mass. 108-page catalog explains the principles of broaching, illustrates and describes line of broaching machines and methods of producing them, and pictures many applications.

5 DRILLING MACHINES — Speedway Machine Co., Worcester, Mass. 4-page bulletin illustrates and describes locating and drilling machine using a new method for obtaining speed and precision in spacing and spotting. Machine uses a magnifying projection to obtain accuracy.

6 LATHES—Central Machine Works Co., Minneapolis 13, Minn. 4-page bulletin describes "Minneapolis" production lathe Model F. Lathe has simplified design intended for inexperienced help.

7 PRECISION GRINDERS — Landis Tool Co., Waynesboro, Pa. 6-page buletin illustrates and gives brief description of tool grinders, centerless grinders, and special grinders.

8 MILLING MACHINES — H. Leach Machinery Co., Providence 4, R. I. 6-page bulletin describes Fray ram-type No. 7-B vertical universal milling machines for which Leach Machinery Company is national distributor.

9 PUNCH PRESSES — Marshalltown Mfg. Co., Marshalltown, Ia. 6-page bulletin illustrates and describes line of open-back, inclinable punch presses. The design is said to provide increased depth of die space, allowing the use of leaderpin dies.

10 MACHINING STAINLESS STEEL —The Carpenter Steel Co., Reading, Pa. 94-page handbook contains much useful information for machining stainless steel. Production and management executives may secure personal copies of the booklet free, additional copies at 50 cents a copy.

11 METAL CUTTING CHART—L. S. Starrett Co., Athol, Mass. Chart combines information needed for cutting metal by hand or power hacksaw and by metal-cutting bandsaw.

12 QUENCHING PRESS — Gleason Works, Rochester 3, N. Y.—8-page bulletin describes No. 16 quenching press which has a sliding lower die mechanism that swings out for easy loading.

13 ROLL GRINDING — Norton Co., Worcester, Mass. 54-page bulletin gives general discussion of roll grinding with many illustrations included.

14 HOBBING & DIE-SINKING PRESSES — Watson-Stillman Co., Roselle, N. J. 8-page bulletin illustrates and describes hobbing and die-sinking presses with capacities from 200 to 3000 tons.

TOOLS AND ACCESSORIES

15 MACHINERY PRODUCTS — Ideal Industries, Inc., Sycamore, Ill. 24-page catalog illustrates and describes a variety of pneumatic tools and accessories, dust collectors, line settlers, balancing ways, etchers, chucks, demagnetizers, surface plates, wheel dressers, and tachometers.

16 TAP HANDBOOK — Charles H. Besly & Co., Chicago 6, Ill. 18-page booklet contains basic information on the selection of taps, including definition, sharpening instructions, and tables.

17 MEASUREMENTS—Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford 1, Conn. 16-page book "Criteria of Measurement" gives brief explanations of various measurement instruments, with illustrations in full color.

18 GEAR TABLES—The Van Keuren Co., Watertown, Mass. 16-page booklet G-37 contains gear measuring table 5 to 500 teeth for 1.68-in. wires. 4-page circular describes Carboloy wire-type plug gages and thread-measuring wires.

19 CIRCULAR FORM TOOL — Hardinge Brothers, Inc., Elmira, N. Y. 4-page bulletin F describes and gives specifications of precision ground circular form tools for automatics, chucking machines, and turret lathes.

20 DIVIDING HEAD—Vinco Corp., Detroit 27, Mich. 20-page booklet describes optical master inspection dividing head for checking angular facing. It is guaranteed to be accurate within two seconds of arc.

21 SCREW MACHINE DRILLS—Chicago-Latrobe Twist Drill Works, Chicago 10, Ill. 6-page folder describes Stub screw machine drills, for use where operating conditions require short, sturdy drills.

22 GEAR CHECKER—National Broach and Machine Co., Detroit 13, Mich. 16-page booklet describes Red Ring universal gear checker. The unit is said to be accurate without being delicate, and to be capable of being used effectively by the average shop man.

23 GAGING — Johnson Gage Co., Bloomfield, Conn. 60-page brochure discusses inspection and quality control of male screw-threads. Discusses various types of gages and their use.

24 ELECTRONIC MAINTENANCE —Westinghouse Electric Corp., Pittsburgh 30, Pa. 30-page pocket handbook "Maintenance of Industrial Electronic Equipment" discusses preventive maintenance operations. Safety precautions to be observed are included.

25 DIAMOND TOOLS — Precision Diamond Tool Co., Elgin, Ill. 20-page catalog No. 46 contains data on the application of diamond tools. Many drawings and tables are included.

Example

Name John Roderick
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FREE LITERATURE

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26 SHELL END MILLS—Nelco Tool Co., Inc., New York, N. Y. 4-page bulletin describes Carboloy-tipped shell mills designed for high-speed milling. Includes recommended cutter speed and chip load.

HEAT-TREATING AND WELDING

27 INDUSTRIAL FURNACES—American Electric Furnace Co., Boston 25, Mass. 50-page bulletin illustrates and describes with specifications complete line of electric and gas heat-treated furnaces.

28 WELDMENTS — Lukenweld, Inc., Coatesville, Pa. 28-page bulletin illustrates and describes many weldments designed and fabricated by Lukenweld, Div. of Lukens Steel Co.

29 RIVET COOLERS—Bowser, Inc., Refrigeration Div., Terryville, Conn. 4-page bulletin describes "Kold-Hold" Sub-Zero rivet coolers. Rivet canisters slip through the top so that there is no lid to raise on the unit.

30 ARC WELDING — Hobart Bros. Co., Troy, Ohio. 4-page bulletin describes 200-amp. gas-engine drive arc welder. The unit is available with or without portable mountings.

31 RESISTANCE WELDING—Sciaky Bros., Inc., Chicago, Ill. New house organ "Resistance Welding at Work" is issued monthly, devoted primarily to step by step analysis of interesting problems in fabrication with resistance welding.

32 FURNACES—W. S. Rockwell Co., Fairfield, Conn. 4-page bulletin No. 424 describes revolving retort furnaces. The furnaces may be gas, oil, or electric operated, parts travel spirally in a continuous stream, with a slow rolling action, through the furnace.

PLANT SERVICE EQUIPMENT

33 PRECIPITATORS—Raytheon Mfg. Co., Waltham 54, Mass. 8-page bulletin describes precipitator for industrial installation. 4-page bulletin describes package unit for smaller applications. Either type is said to remove 90% of airborne dirt.

34 MATERIALS HANDLING — Market Forge Co., Everett 49, Mass. 8-page bulletin 1005 MH describes "Load Lift" for lifting and transporting materials. 4-page bulletin 1004 MH describes "Load-Veyors," portable conveyors which can be used with or without side rails by inverting.

35 SHAKEOUT — Robins Conveyors, Inc., Passaic, N. J. 4-page bulletin No. 124-F describes and illustrates a portable unit which lifts flasks off the foundry floor, deposits them on the receiving table, turns them upside-down, shakes out the sand, and discharges the castings.

36 CONVEYOR BELTS—The Cambridge Wire Cloth Co., Cambridge, Md. 4-page bulletin No. 83 illustrates and describes wire-belts for industrial furnaces and other applications.

37 FLUORESCENT LAMPS — Westinghouse Electric Corp., Pittsburgh 30, Pa. 24-page booklet A-4759 explains basic principles and operating characteristics of fluorescent lamps and auxiliaries. Diagrams explain factors affecting lamp life and maintenance.

38 ELECTROPLATING CONVEYORS—Hanson-Van Winkle Munning Co., Matawan, N. J. 22-page bulletin FA-102 describes line of conveyors, including elevator type, Munning type, straight-line type and a variety of special plating machines.

PARTS AND MATERIALS

39 LUBRICATION SYSTEM — Alemite Division, Stewart Warner Corp., Chicago, Ill. 16-page booklet "Caution: Reading This May Raise Your Blood Pressure" describes "Coloroute," a complete plan of lubrication covering selection, handling, and application of lubricants.

40 HONING—Minnesota Mining and Manufacturing Co., St. Paul 6, Minn. 8-page bulletin "Honite for Free Mass Precision Honing" describes a natural honing stone aggregate for use in tumbling barrels.

41 HYDRAULIC CALCULATOR — Hanna Engineering Works, Chicago 22, Ill. "Calculator for Hanna Hydraulic Cylinders" is a slide rule for computing pump delivery and horsepower required, as well as other hydraulic data.

42 PIPE AND FITTING MATERIALS—Tube Turns, Inc., Louisville 1, Ky. Loose-leaf chart showing grade and standard type numbers. ASTM specifications and service limitations, with description of welding procedure.

43 SCOTCH TAPE—Minnesota Mining & Manufacturing Co., St. Paul 6, Minn. 24-page bulletin illustrates and describes "Scotch" Brand pressure sensitive tape. Masking, protecting, holding, sealing, reinforcing, and other applications, are illustrated and described.

44 TIME RECORDERS — Simplex Time Recorder Co., Gardner, Mass. 4-page bulletin 117 describes Productographs which will record stops and starts on up to seven individual machines. The unit records any action which can be governed by opening or closing a conventional switch.

45 SPEED REDUCERS—D. O. James Mfg. Co., Chicago, Ill. 575-page catalog 1000 contains complete engineering data, dimensions, rating tables, and general information on design and application of cut gears, gear speed reducing transmissions, and flexible couplings. Includes data on gear design problems.

46 HYDRAULICS—Superdraulic Corp., Dearborn, Mich. Bi-monthly publication "Hydraulic Progress" plans to report what is going on in the field of hydraulics, the how and why of basic hydraulic devices, new applications of hydraulic power.

47 FASTENER—Lion Fastener, Inc., Honeoye Falls, N. Y. 4-page bulletin 462 describes fasteners for plywood, plastic, and metal products. A spring-locking fastener, it is said to be vibration proof.

48 ROUND STEEL TUBING—The Ohio Seamless Tube Co., Shelby, Ohio. 16-page booklet contains master weight tables for round steel tubing, as well as other shapes of tubing.

49 HYDRAULIC PUMP — Sundstrand Machine Tool Co., Rockford, Ill. 12-page bulletin describes "Circuit Control" pump. The pump contains units for feeding, rapid traverse, and directional control all in one housing.

50 BRONZE ELECTRODE — Ampco Metal, Inc., Milwaukee 4, Wis. Chart contains the AWS-ASTM classification of bronze electrodes and the grade numbers of arc welding rods produced by 15 manufacturers which meet these classifications.

51 PLASTICS — Bakelite Corp., New York 17, N. Y. 36-page booklet, "The ABC's of Modern Plastics," gives a brief outline of the origin, preparation, and uses of plastics.

52 TOOL STEEL—Crucible Steel Co. of America, New York 17, N. Y. 30-page booklet "Tool Steel for the Non-Metallurgist" contains a series of articles discussing characteristics and treatment of steel.

53 LUBRICATION — Sun Oil Co., Philadelphia 3, Pa. 6-page folder describes Suntac oils and their performance in various specific applications.

54 BALL BUSHINGS—Thomson Industries, Inc., Long Island City 1, N. Y. 16-page bulletin describes ball bushings, explaining operations, and giving engineering data.

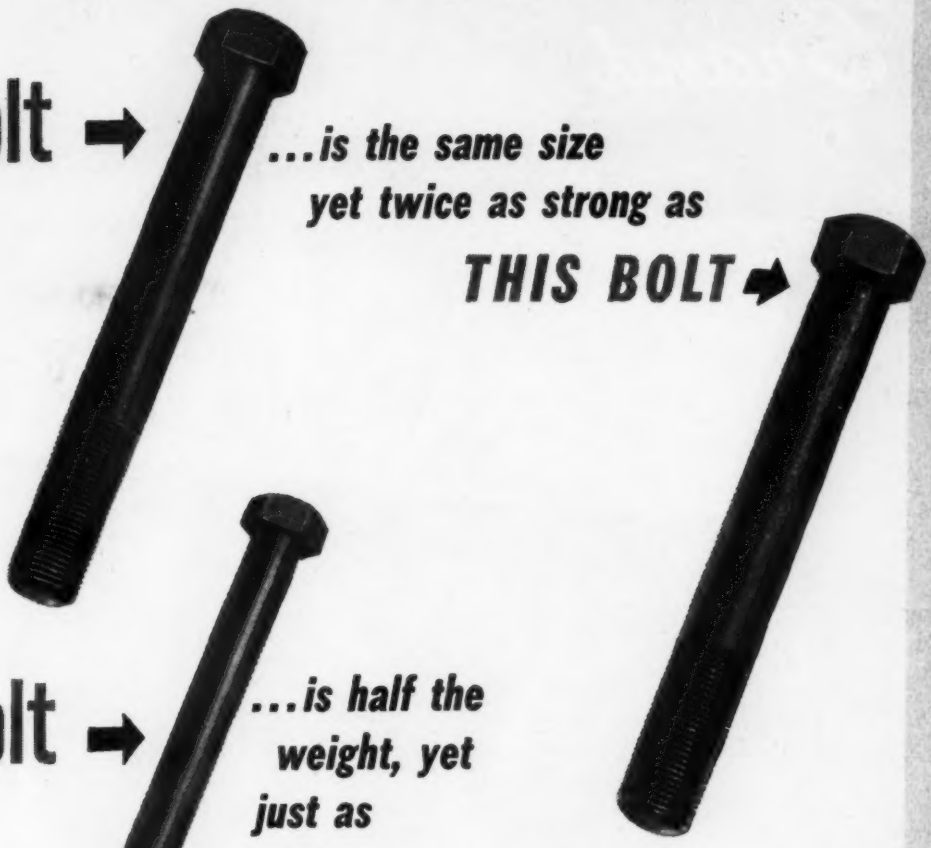
55 TOOL STEEL—Jessop Steel Co., Washington, Pa. 8-page booklet describes Type R composite tool steel to combine the hardness and edge-holding properties of a high-alloy steel with toughness and machinability of a low-alloy steel.

MISCELLANEOUS

56 SAFETY POSTERS—Willson Products, Inc., Reading, Pa. Series of posters designed to reduce eye accidents. Contrasts colorful Kodakrome pictures with a large patch of black. Available to all plants for bulletin board use.

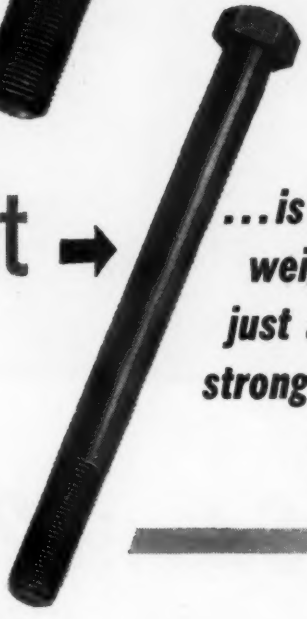
57 ENGINEERING SERVICE—Pioneer Engineering & Mfg. Co., Detroit 3, Mich. 24-page booklet describes how an independent engineering organization functions and the scope of its services.

This Bolt ➡ ...is the same size yet twice as strong as THIS BOLT ➡



...and

This Bolt ➡ ...is half the weight, yet just as strong as THIS BOLT



These treated NICKEL ALLOY STEEL BOLTS will develop 100% greater unit tensile strength than untreated carbon steel bolts

Tensile testing Nickel alloy steel bolts at the plant of Lamson & Sessions Company, Cleveland, Ohio.

Whether you aim to gain greater holding power, or save weight and gain space, these Nickel alloy steel bolts will help you.

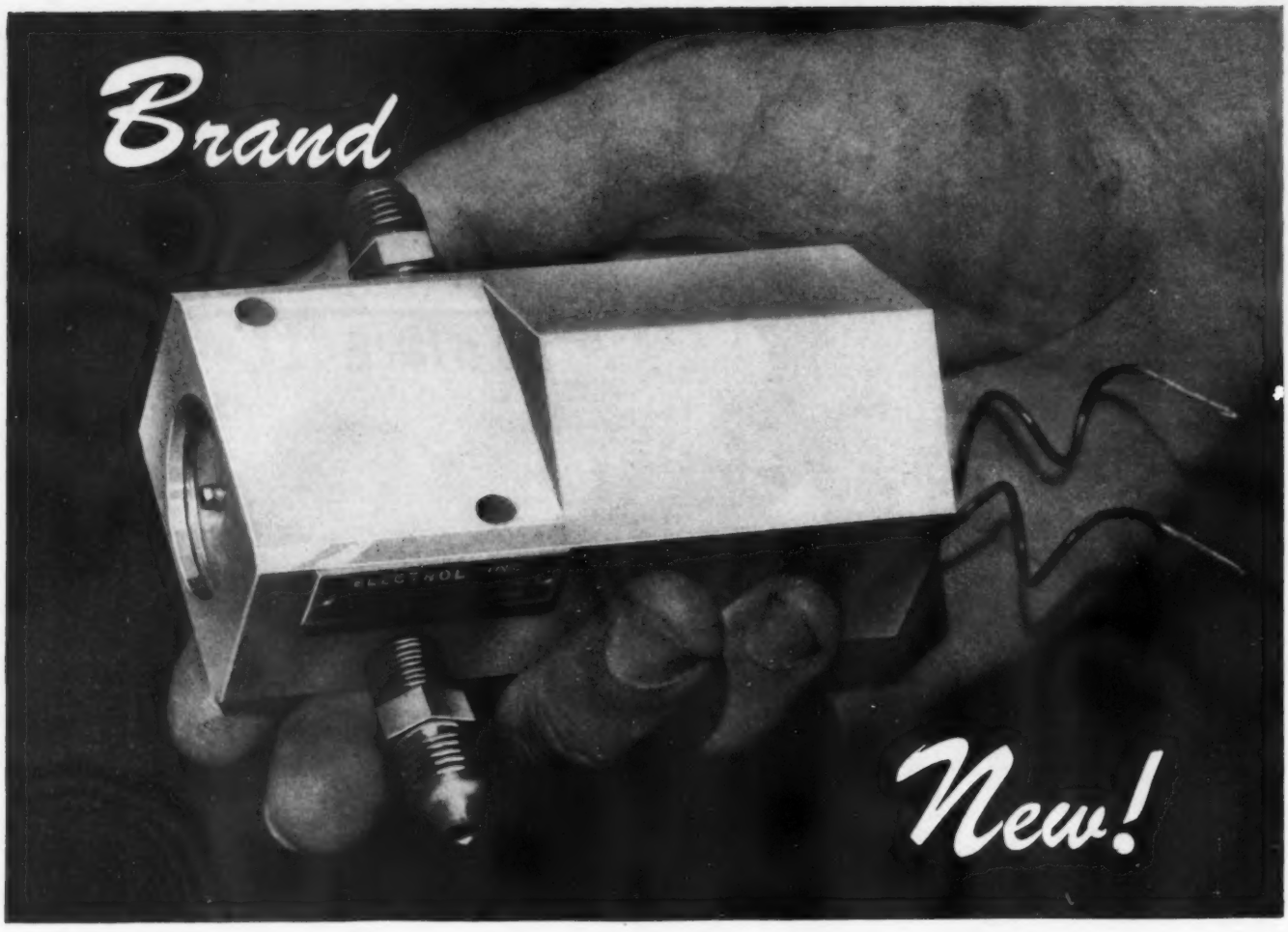
If bolt holes are already in the part, ¾" heat-treated 3135 or 8635 Nickel alloy steel bolt gives twice the holding power of a ¾" untreated 1020 carbon steel bolt.

On the other hand, if bolt holes are not in, and design does not permit a ¾" bolt, remember a ½" bolt of the same Nickel alloy steels, heat treated, gives almost as much holding power as a ¾" untreated 1020 carbon steel bolt, *and weighs less than half as much.*

EMBLEM OF SERVICE INCO Nickel TRADE MARK

Over the years, International Nickel has accumulated a fund of useful information on the selection, fabrication, treatment and application of alloys containing Nickel. This information and data are yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.



ELECTROL'S Solenoid 2-way Valve

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and
Transfer Valves

. . . provides remote control of hydraulic valve *without* the conventional tubing and oil lines and makes it *ideal* for use in crowded and hard-to-get-at places . . . It is lighter (weighs only 1¼ pounds) . . . Smaller (measures only 3 9/16" x 1¾" hexagon) . . . Operates on 12-24 volt direct current . . . Accommodates flow up to 2 gallons per minute with pressure range *from a fraction of a pound per square inch* up to 1500 P.S.I. Complete information on this new, effective, efficient, economical SOLENOID 2-WAY VALVE will be mailed upon request.

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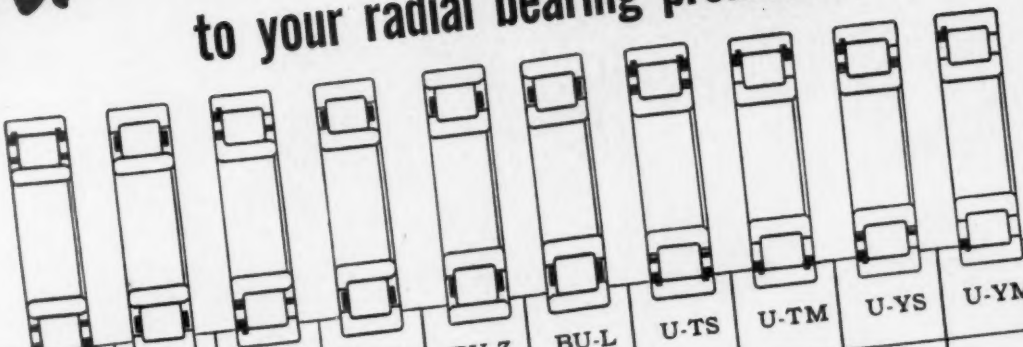
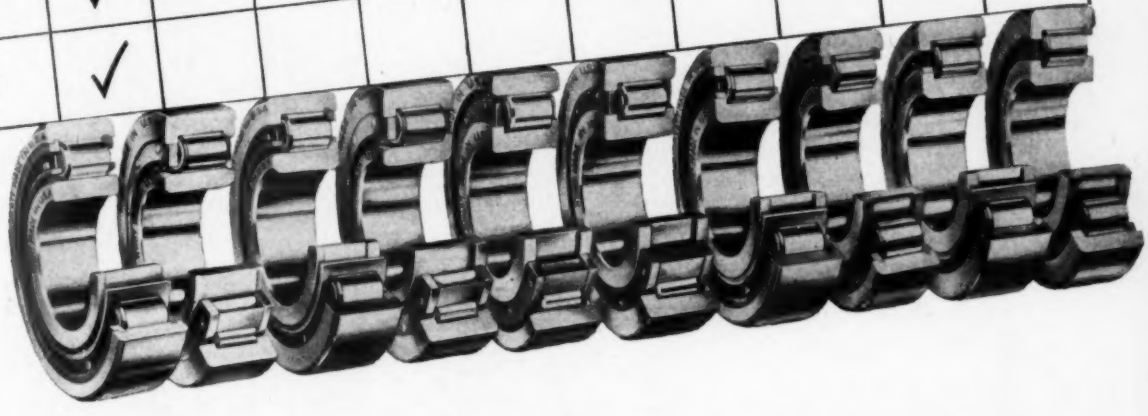
Hyatt has the Answers

to your radial bearing problems



SERIES	A-TS	A-WB	R-YS	R-WB	BU-Z	BU-L	U-TS	U-TM	U-YS	U-YM
1000		✓		✓	✓	✓				
1200	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5000		✓			✓					
5200	✓	✓			✓		✓	✓		
5300	✓	✓			✓		✓	✓		
6200	✓									

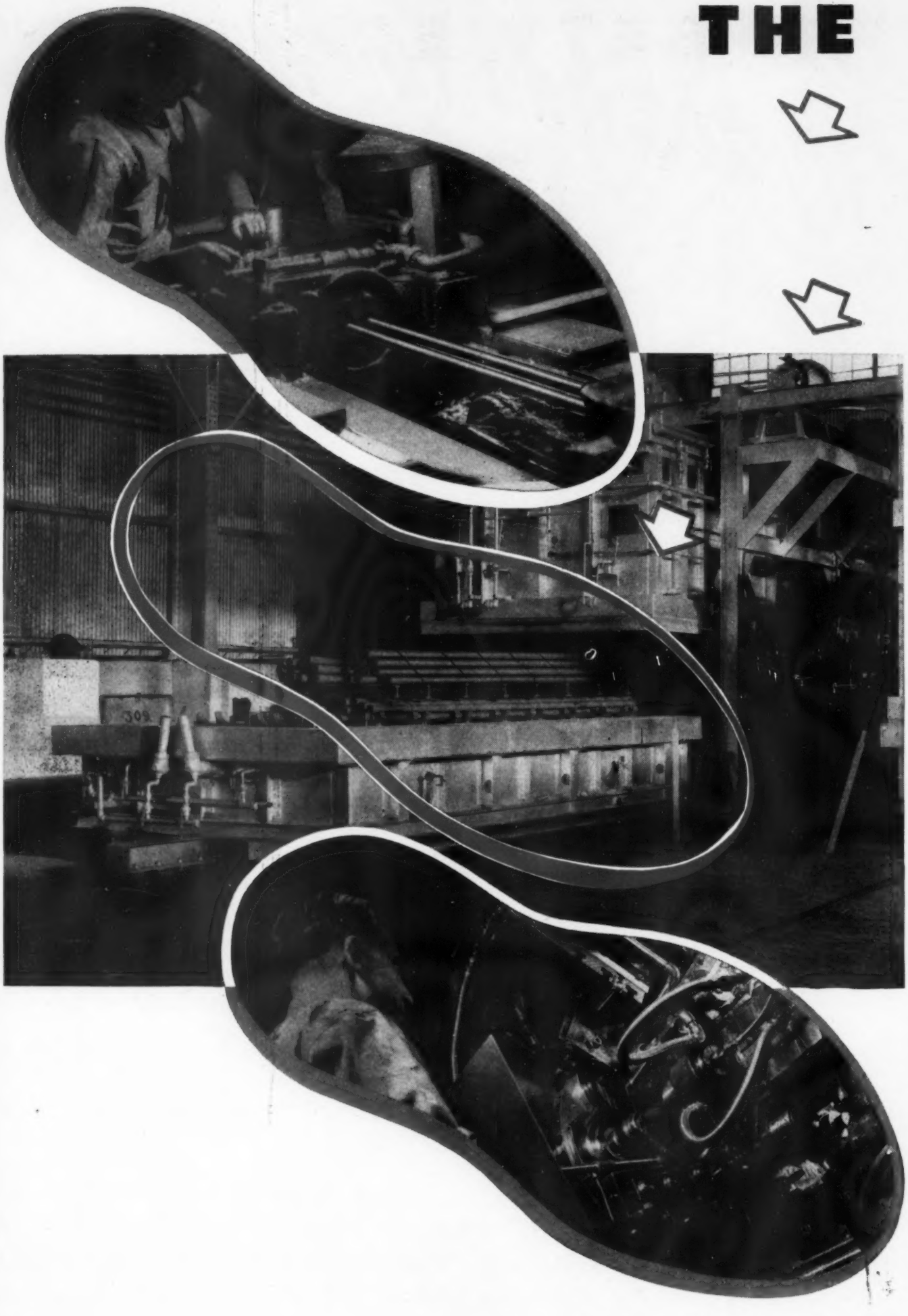


TEN MAJOR TYPES. 1000 to 6200 series. Separable and non-separable classes. Maximum capacity for standard A. F. B. M. A. dimensions. These are the quick facts about Hyatt Hy-Load Solid Roller Radial Bearings. Full information (including dimensions and load ratings) is in the new 88-page Hy-Load Catalog, just off the press. A complete engineering guide to radial bearing selection and use. Write now for a free copy, without obligation.

HYATT BEARINGS DIVISION · GENERAL MOTORS CORPORATION

Harrison, New Jersey · Chicago · Detroit · Pittsburgh · Oakland, California

THE



"IN-BETWEEN STEP"

that leads to better

MACHINABILITY

It's furnace treatment—an important step between hot rolling and cold drawing of steel bars, or between the cold drawing operation and the use of the bars in automatic screw machines or other machine tools. It may be annealing, normalizing, spheroidizing, stress relieving or other form of furnace treatment.

Furnace treatment of the cold drawn steel bars you use can bring you several distinct advantages:

1. It insures uniformity of structure, physical properties, hardness and surface.
2. It permits consistent production of the particular microstructure best suited to the machining operations involved.
3. It relieves internal stresses which, especially in the higher carbon type bars, can result in warpage and distortion during unsymmetrical machining.
4. It substantially increases the most important quality of cold drawn steels—MACHINABILITY.
5. If you manufacture steel parts which are surface or selective hardened by induction heating methods, the bars can be furnace treated in prepared atmosphere to prevent decarburization.

Always alert for ways to improve cold drawn steels and to step up MACHINABILITY, Republic's Union Drawn Steel Division has installed the most modern furnace equipment in its various plants to supply *every type* of furnace treated cold drawn steels, both in coils and in bar form.

And Republic metallurgists are ready to discuss the benefits of these steels as applied to *your specific product.* Write us.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Republic

UNION COLD DRAWN STEELS

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Stock Sizes or "Specials" . . . to meet any requirement

REGULARLY STOCKED in 1088 sizes ranging from ¼" x ⅜" x 1¼" to 4" x 4½" x 6", Buckeye's fully finished ready-to-use stock bearings are the time proved answer for most requirements. For others, Buckeye "Specials" furnished in any recognized bronze bearing analysis; and in any ID, OD and length; slotted, split, drilled or flanged; plain, graphited, or with machined oil grooves, will meet exactly, your own particular, individual needs.

Manufactured from selected materials under our exacting laboratory and metallurgical control, these bearings measure up fully to Buckeye's exacting specifications. Each is a quality product, free from porosity and accurately dimensioned within the required limits assuring speedy, easy assembly, and long, efficient service. Let us quote on your requirements.

Buckeye

BRASS AND MANUFACTURING COMPANY

BRONZESMITHS SINCE 1900

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BRONZE SLEEVE BEARINGS · STANDARD SIZES OR TO CUSTOMERS' BLUEPRINT IN ANY RECOGNIZED BEARING METAL ANALYSIS

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3600
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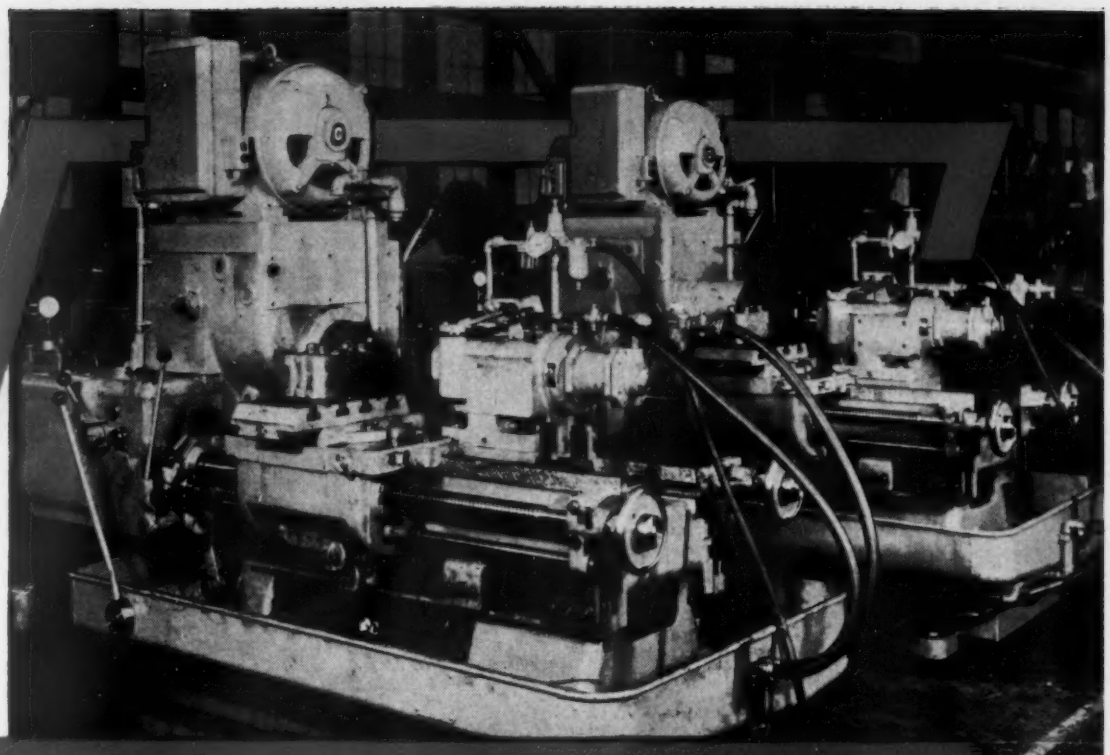

For Precision Work at High Speed....

Select CENTURY MOTORS

Their remarkable freedom from vibration enables you to get all the precision that your machine was designed to give.

On applications such as the automatic lathes shown above, Century supplied 3600 RPM squirrel cage 30 horsepower motors to provide the speed range required by the manufacturer. To assure maximum precision at this high speed, these motors were specially balanced.

Whether your electric motor applications require high speeds and special balancing — or normal operating speeds, there's a Century motor that will operate your machine at top performance. Rigid construction and accurate machining plus good electrical and mechanical balance help to maintain smooth operation throughout their long life.

Century motors are built in a wide range of types — open and protected — in sizes from 1/6 to 400 horsepower. They are engineered to the functional characteristics of the machines they drive to assure top performance. Specify Century motors for all your electrically powered equipment.

CENTURY ELECTRIC COMPANY

1806 Pine Street, St. Louis 3, Mo.

Offices and Stock Points in Principal Cities

Century C MOTORS

490

Boeing Aircraft Company treats bomber dies with

TECTYL

When placed in permanent storage, the large and costly dies, used in B-17 production, must be thoroughly protected against rust and corrosion. For this important purpose, Boeing Aircraft Company (Seattle and Renton, Washington) sprays them with Tectyl 506.

The Boeing Aircraft Company uses other Tectyl compounds — for instance Tectyl 508 to protect dies placed in temporary storage. This Tectyl treatment provides needed lubrication when the dies are returned to service.

Tectyl is used on huge dies such as those required for fuselage and tail sections. →

Large dies for B-17 are sprayed with Tectyl to protect against rust and corrosion in permanent storage.

Photo Courtesy Boeing Aircraft Co.

Tectyl is made in many specialized types

There is a Tectyl solution for every rust problem. Tectyl — not a paint — leaves a thin, transparent film that protects metals against rust and corrosion for as long as two years. Tectyl is effective indoors or outdoors — in fresh and salt atmospheres.

Tectyl can be sprayed, brushed or flushed on, or parts can be dipped. Tectyl need not be removed for inspection of surface — leaves ideal surface for painting. Tectyl can be removed easily at any time with kerosene. For detailed information, write, stating type of rust problems encountered in your plant.

VALVOLINE TECTYL *ENDS RUST*

FREEDOM-VALVOLINE OIL COMPANY

DEPT. 38I, FREEDOM, PENNSYLVANIA

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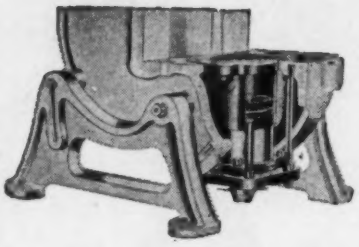
+ INCREASED PRODUCTION
— REDUCED SETUP TIME
= DAYTON ROGERS DIE CUSHIONS

No matter how you figure it Dayton Rogers Die Cushions will assure better results and lower production costs on your punch press operations because:



1. They are readily adapted to either short run quantity requirements or for large quantity production.
2. They automatically convert a press from single action to double action for deep drawing work.
3. Correct pressure pad control on forming dies obtained quickly by simply adjusting the pressure regulator.
4. They afford positive stripping action on all compound, blanking and piercing dies.

Write for illustrated, engineering catalog #100-1

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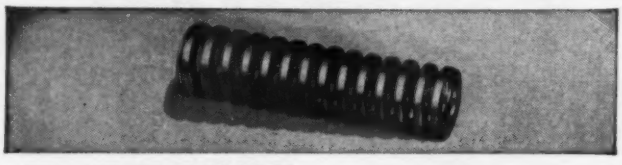

DANLY DIE SPRINGS

MEDIUM PRESSURE HIGH DEFLECTION
HIGH PRESSURE MEDIUM DEFLECTION

DANLY MACHINE SPECIALTIES, INC.
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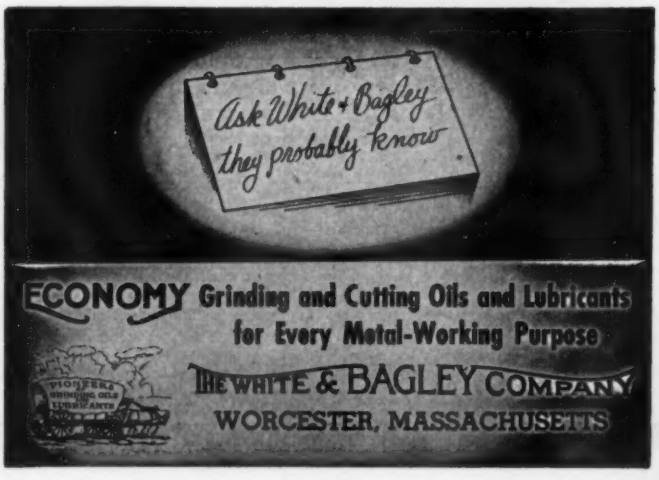

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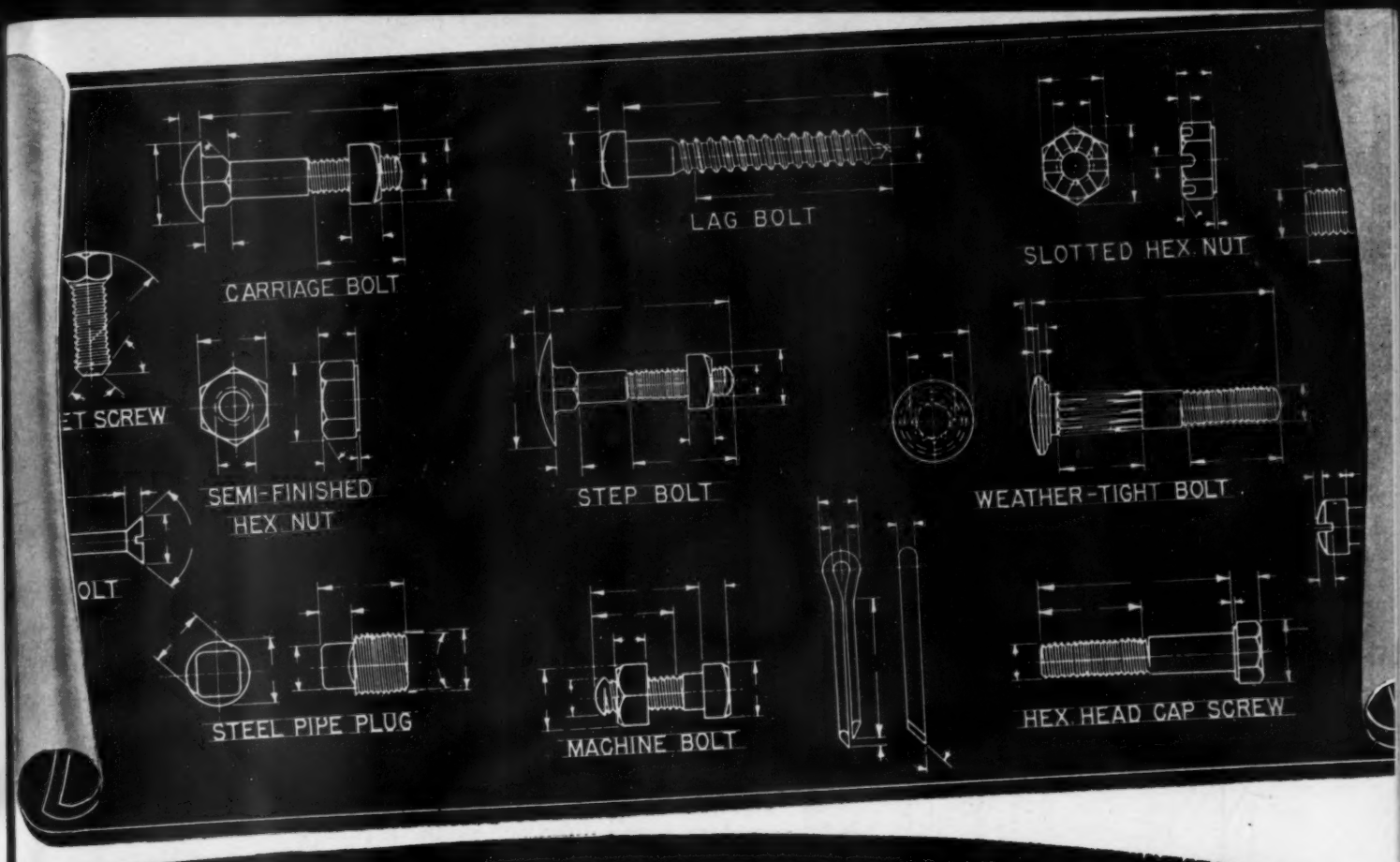

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...specify "standard" bolts and nuts

MORE than 400,000 *standard* headed and threaded fastenings are made by bolt manufacturers. Thousands of these standard products are always in stock, and those not in stock can be produced quickly.

We also make "specials" to your order, *when you really need* a "special".

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Do not hesitate to ask for the services of Lamson engineers. *They are trained* to help you determine which *standard* bolt and nut products will fit into the design of *your product* most efficiently and economically. *They are experienced* in having done this for our customers many times before with tangible advantages that our customers appreciate. Ask a Lamson engineer to call to talk it over.

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☐ **"BOLTS, NUTS AND SCREWS"**—1944 Revision. Cloth bound. Limited edition, 180 pages of technical, practical information. Sent prepaid for $1.00—*check or cash must accompany your order.*

Authentic engineering data, charts, tables in one cloth-bound 169 page volume, **"BOLT, NUT AND RIVET STANDARDS,"** may be obtained from the publishers, American Institute of Bolt, Nut and Rivet Manufacturers, 1550 Hanna Building, Cleveland, Ohio for $1.00, prepaid, if remittance accompanies your order.

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UDS · STOVE BOLTS · SHEET METAL SCREWS · WIRE ROPE CLIPS · PIPE PLUGS · WEATHER-TIGHT BOLTS · MACHINE SCREWS AND NUTS · SPECIALS

DAYTON V-BELTS

absorb shocks...eliminate slippage

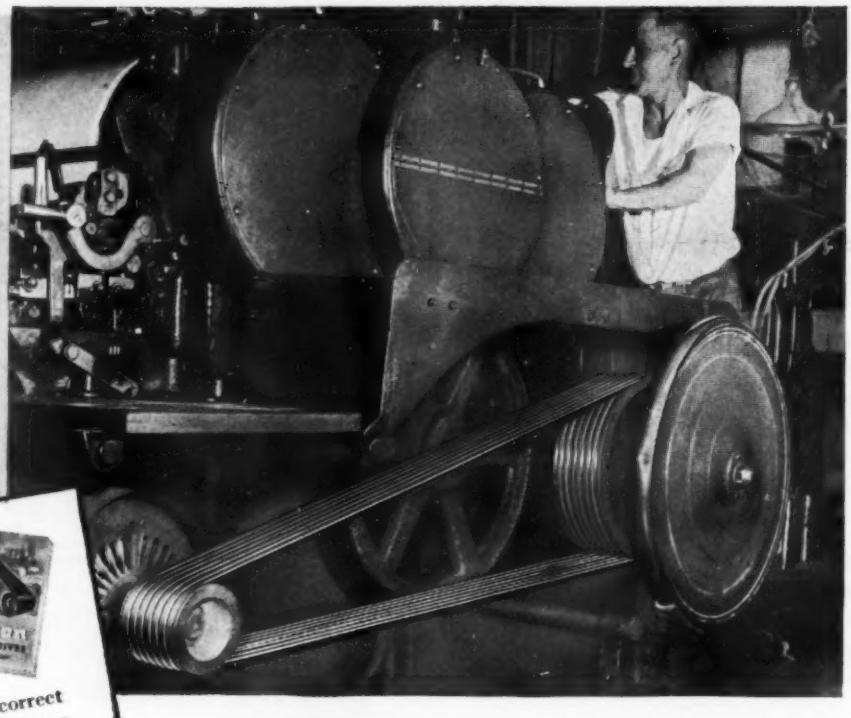
PROVIDE POSITIVE POWER TRANSMISSION

Original belts on the two-color presses of one of the country's largest printing plants started and stopped the presses with an abrupt shock . . . slipped frequently, causing uneven operation. Result was excessive wear on press parts and motor armature, requiring frequent repair. Moreover, belts broke frequently, causing complete shutdowns, loss of production and sometimes missed deadlines. Troubled, management tried Dayton V-Belts. Now power is delivered evenly, presses start and stop smoothly, belt slippage has been eliminated . . . maintenance costs have been reduced . . . production has been stepped up. Dayton V-Belts transmit power smoothly and positively because the *engineered* resilience of Dayton V-Belts, and the seating action of the belts in the pulley grooves, absorb the shocks of suddenly applied power. Their scientific design and construction is the result of over 40 years of research and manufacturing experience working with natural and synthetic rubber. It is experience that can help you solve your power transmission drive problems. For full information write The Dayton Rubber Manufacturing Company, Dayton 1, Ohio.

ATTENTION

POWER TRANSMISSION ENGINEERS:

There is a mill supply house near you that stocks Dayton V-Belts. A representative will gladly discuss your power transmission drive problems with you. Look for the name under the trade name heading "Dayton V-Belts" in the yellow pages of your telephone book.



WRITE TODAY FOR YOUR DAYTON CATALOG:

The Dayton No. 280 catalog contains 384 pages of tables and data that make selecting the correct V-Belt Drive quick and easy. Write for your copy today. It's free.

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Dayton Rubber
REG. TRADE MARK THE DAYTON RUBBER MFG. CO.
THE MARK OF TECHNICAL EXCELLENCE IN SYNTHETIC RUBBER

THE WORLD'S LARGEST MANUFACTURER OF V-BELTS

Vibration

LOWERS WORKERS' MORALE
SHORTENS MACHINE LIFE
INCREASES REJECTS
CUTS YOUR PROFITS

Control it with

LORD
SHEAR TYPE
Bonded Rubber
MOUNTINGS

"VIBRATION nerves" are not the only cause of industrial fatigue, but they are a sure cause . . . and controllable, because vibration is controllable. Lord, pioneer in vibration control, has made better working conditions for hundreds of manufacturers, with consequent improved morale, increased output, and lowered employee turnover.

Machines, as well as men, are vulnerable to the destructive forces of vibration. Vibration control improves the quality of the machine's output, lowers maintenance cost, and greatly extends its useful life.

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Lord-engineered vibration control in your plant is a small investment with large and far-reaching returns. Write for Bulletin 104.

Every genuine Lord Mounting carries the name "LORD" embossed in the rubber or in raised letters on the forgings.

IT TAKES BONDED RUBBER *In Shear* TO ABSORB VIBRATION

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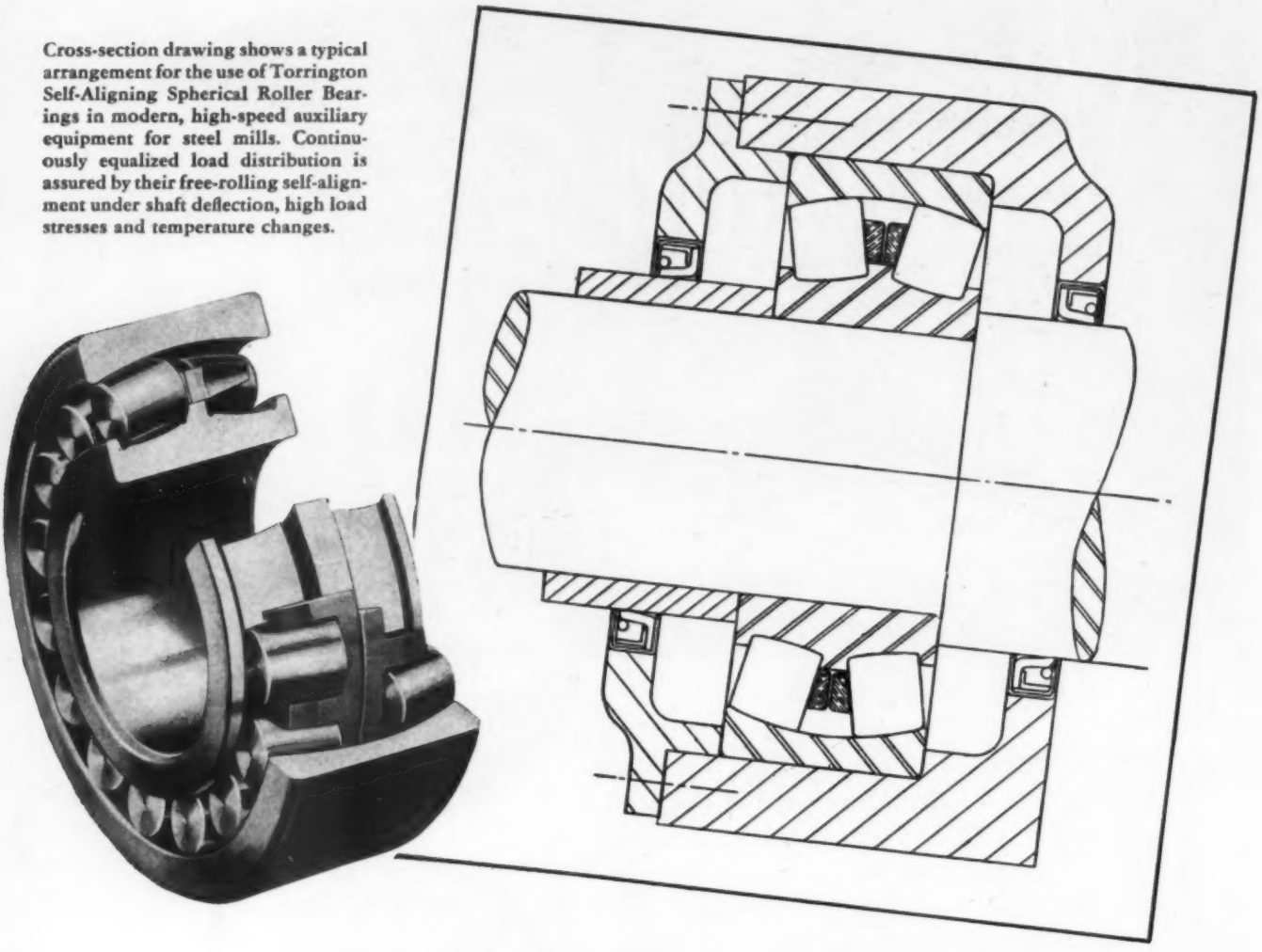
TORONTO, CANADA

Originators of Shear Type Bonded Rubber Mountings

Cross-section drawing shows a typical arrangement for the use of Torrington Self-Aligning Spherical Roller Bearings in modern, high-speed auxiliary equipment for steel mills. Continuously equalized load distribution is assured by their free-rolling self-alignment under shaft deflection, high load stresses and temperature changes.



FOR SUSTAINED CAPACITY

Throughout the steel, oil, paper, construction, machine tool and many other industries, Torrington Self-Aligning Spherical Roller Bearings can handle heavy radial and thrust loads at high speeds. With equalized load distribution assured by their free-rolling self-alignment, they provide *sustained capacity.*

Consequently, the Spherical Roller Bearings' tremendous radial capacity... high two-directional thrust capacity...are little affected by shock loads, shaft deflection or frame misalignment. They are easy to install and service because of their unit construction . . . require a minimum of maintenance attention. This means *sustained operation* with fewer interruptions.

To help you adapt the Spherical Roller Bearing to machinery you design, manufacture or operate, Torrington's Bantam Bearings Division will be glad to offer practical engineering suggestions. For further information write for our Bulletin No. 200 or see your nearest Torrington Representative.

THE TORRINGTON COMPANY

BANTAM BEARINGS DIVISION • SOUTH BEND 21, IND.

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SPHERICAL ROLLER • STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL

CLEAN, CONTROL *and* LUBRICATE

THE DRIVING POWER OF AIR TOOLS AND CYLINDERS

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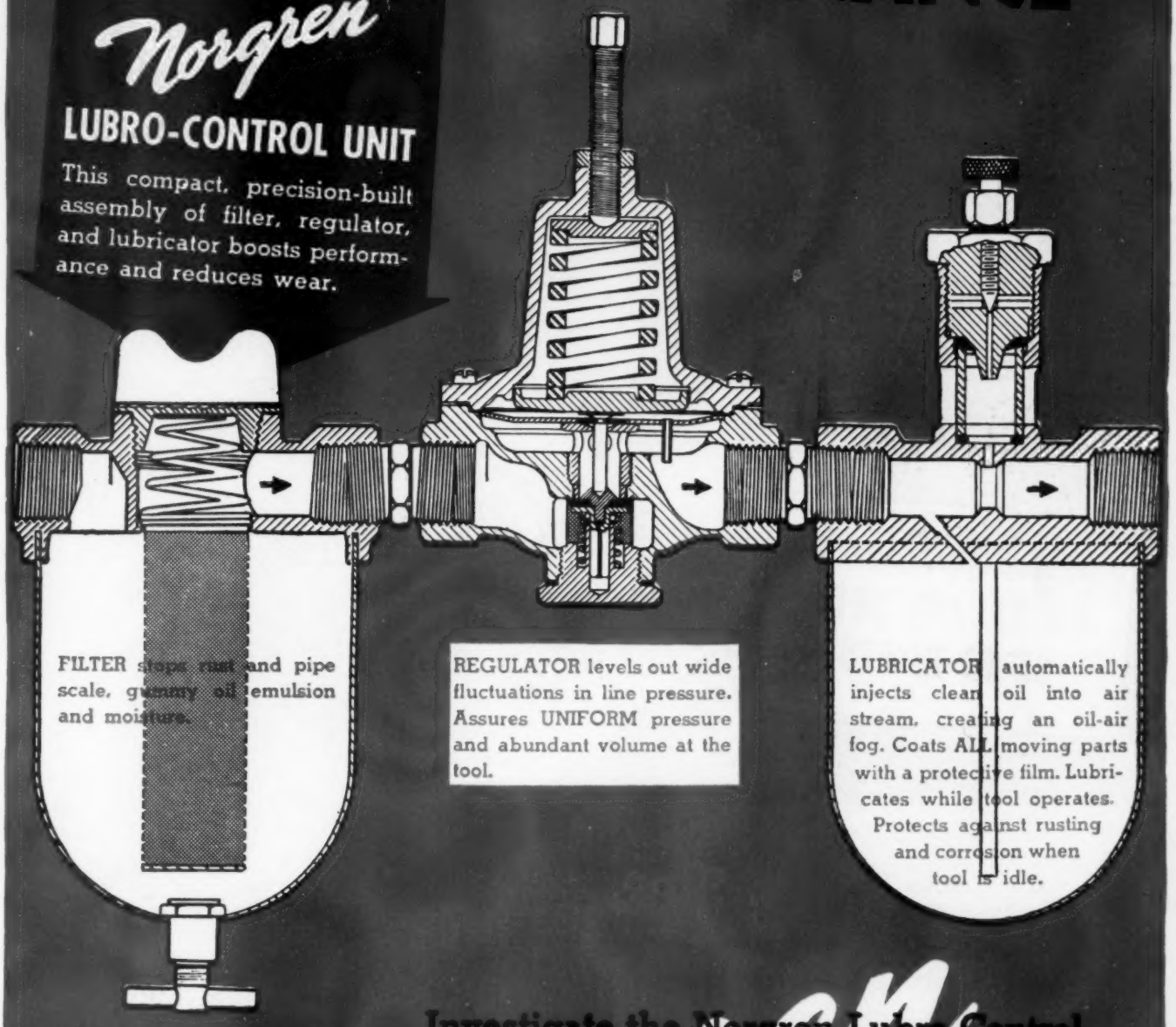
LUBRO-CONTROL UNIT

This compact, precision-built assembly of filter, regulator, and lubricator boosts performance and reduces wear.

Cut AIR TOOL MAINTENANCE



FILTER stops rust and pipe scale, gummy oil emulsion and moisture.

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LUBRICATOR automatically injects clean oil into air stream, creating an oil-air fog. Coats ALL moving parts with a protective film. Lubricates while tool operates. Protects against rusting and corrosion when tool is idle.

Investigate the Norgren Lubro-Control Unit today. Simplest, most economical and positive method known for protecting air-driven tools, cylinders, chucks, etc. Write for Catalog 400. C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colo.

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Rivet-Setting Problems

with **T-J RIVITOR**

You can set a fast pace in riveting operations—and count on smooth and steady production—with the T-J RIVITOR! Designed to increase speed and efficiency of riveting and assembly in many industries. Electrically powered for automatically feeding and setting solid steel rivets 1/16" to 1/4" dia. incl. and up to 7/8" incl. long. Has *controlled setting action*—assures a completely filled hole . . . no flashing . . . a neat, balanced head. Makes a solid rivet joint of 10% to 15% greater strength. Sturdily built . . . trouble-free performance. Write for bulletin. The Tomkins-Johnson Co., Jackson, Michigan.

29 YEARS EXPERIENCE

TOMKINS-JOHNSON
RIVITORS

SPECIFY T-J FOR TOUGH JOBS

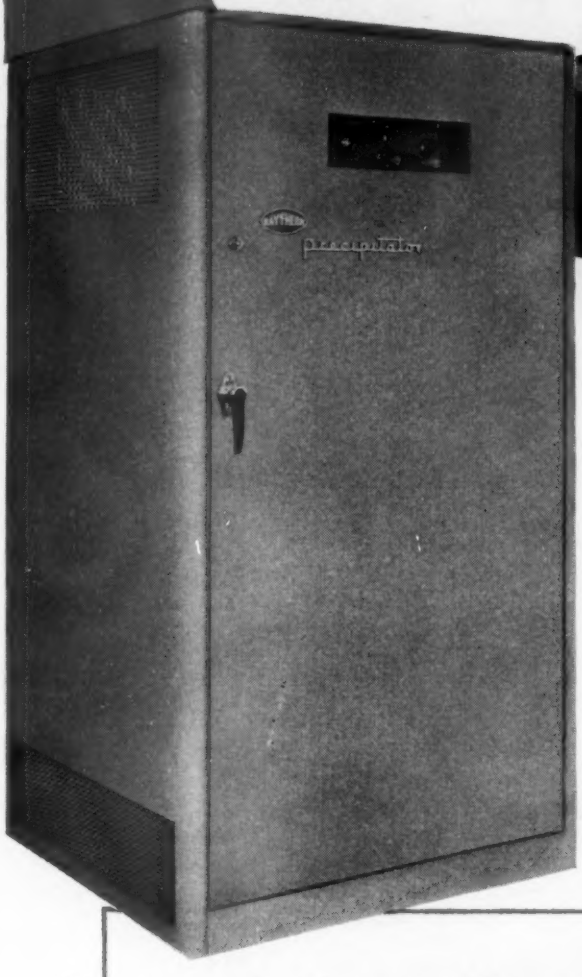
RAYTHEON *Presents*

the newest precision machine for the production of electronically clean air

THE

RAYTHEON PRECIPITATOR

NOW READY FOR DELIVERY!



For metal processing, fabricating, measuring and testing areas—everywhere clean air pays dividends

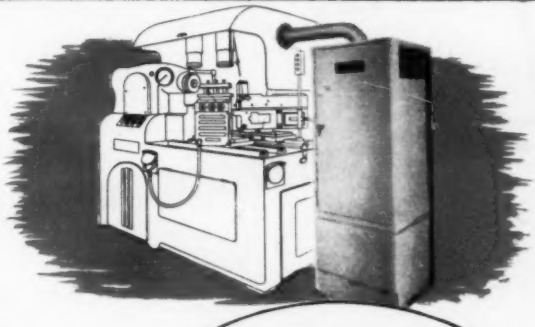
Illustrated is Raytheon's 1200 C.F.M. *Package Unit* Precipitator for removal of dust, soot, smoke, pollen and *oil mist*. For larger areas Raytheon Precipitators in cell-unit construction to fit any requirement are ready to go to work for you.

Raytheon engineers are ready to employ their unsurpassed experience in the practical application of electronic air cleaning to any problem in your plant.

Before you invest in air cleaning equipment of any kind, get the story on this new and better Electronic Precipitator and what it will do for you. Write for Bulletin DL-P-505.

HERE IS RAYTHEON'S OIL MIST PRECIPITATOR

an invaluable aid to productivity, safety and economy on machinery, grinding or high speed cutting operations. The Raytheon Precipitator removes particles of oil or dust as small as one 250,000th of an inch in diameter.



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Industrial Electronics Division, Waltham 54, Massachusetts

Builders of Raytheon Dielectric Heaters for every industrial application, Synchronous Controls for Resistance Welding and other Electronic Products for Industry

Excellence in Electronics

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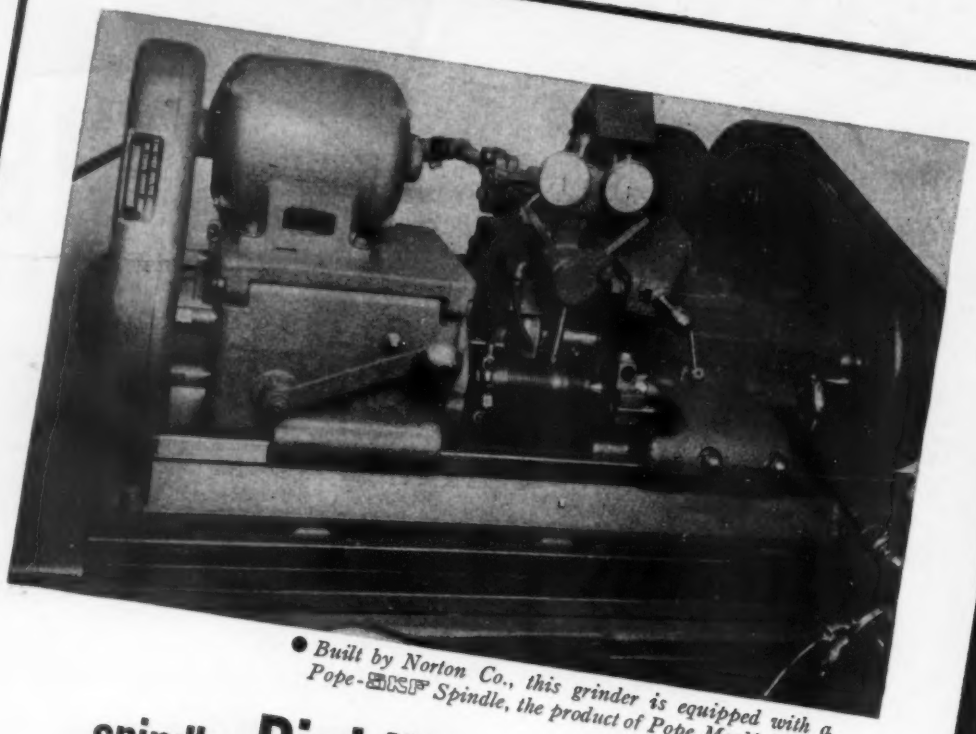

● *Built by Norton Co., this grinder is equipped with a Pope-SKF Spindle, the product of Pope Mach'y Corp.*

spindle Rigidity for work accuracy and fine finish

There's no question about the good performance of this Norton 6 x 18″ Type C Cylindrical Grinder. Accuracy and rigidity are assured by its Pope-SKF Precision Roller Bearing Grinder Spindle. At low speeds, the *inherent rigidity* of this mounting insures chatterfree form cuts. At high speeds, it makes certain of dimensional accuracy and finish smoothness under light feeds and cuts. Send for catalog, "SKF Machine Tool Spindle Bearings."

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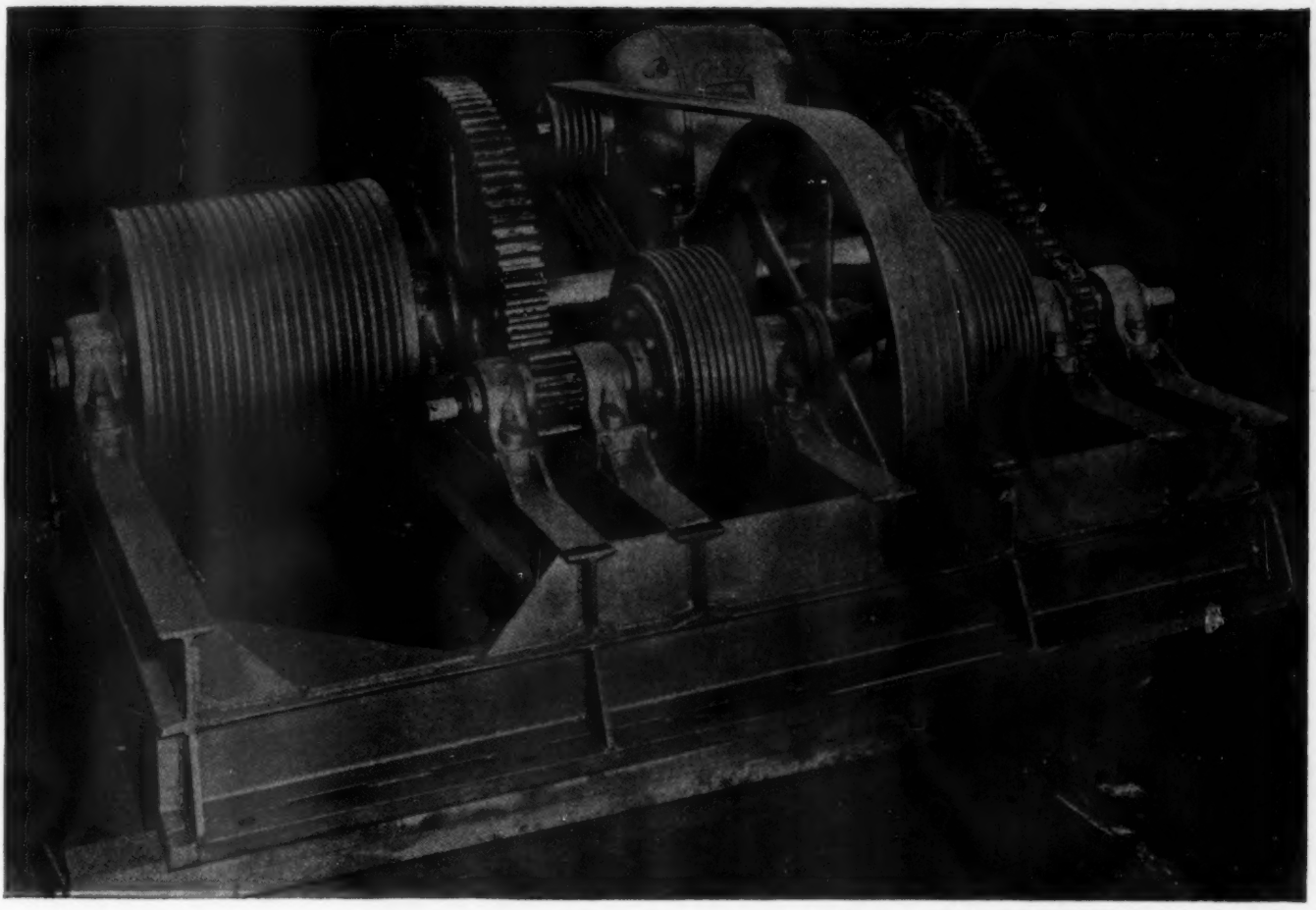
SKF INDUSTRIES, INC.
Front St. & Erie Ave., Phila. 34, Pa.

SKF
Puts the
RIGHT BEARING
in the
RIGHT PLACE



Saw Mill Carriage Drive equipped with Fawick Airflex Clutches.

YOU CAN GET RID OF NEEDLESS CLUTCH EXPENSE

Why pay a useless penalty for sticking to conventional old-style clutches for heavy-duty drives?

Operating entirely through controlled air pressure, the Fawick Airflex Clutch brings you these proved operating savings:

1. Reduced maintenance—no adjustments to make —no lubrication required.
2. No arms, springs or levers to wear out or break.
3. Replacement of parts seldom required.
4. Down time reduced.
5. Torque, shock and vibration controlled by air—full protection for both prime mover and driven unit.
6. Remote control through air pressure, if needed.

These are not experimental hopes—they are proved facts—on machines just like yours.

Our experienced men will gladly help you engineer and install Fawick Clutches, Slip Clutches, Brakes and Power Take-offs. Let us hear from you.

FAWICK AIRFLEX COMPANY, INC.

9919 Clinton Road • Cleveland 11, Ohio

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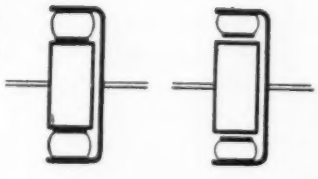
In Britain, Crofts Engineering, Ltd., Bradford, England



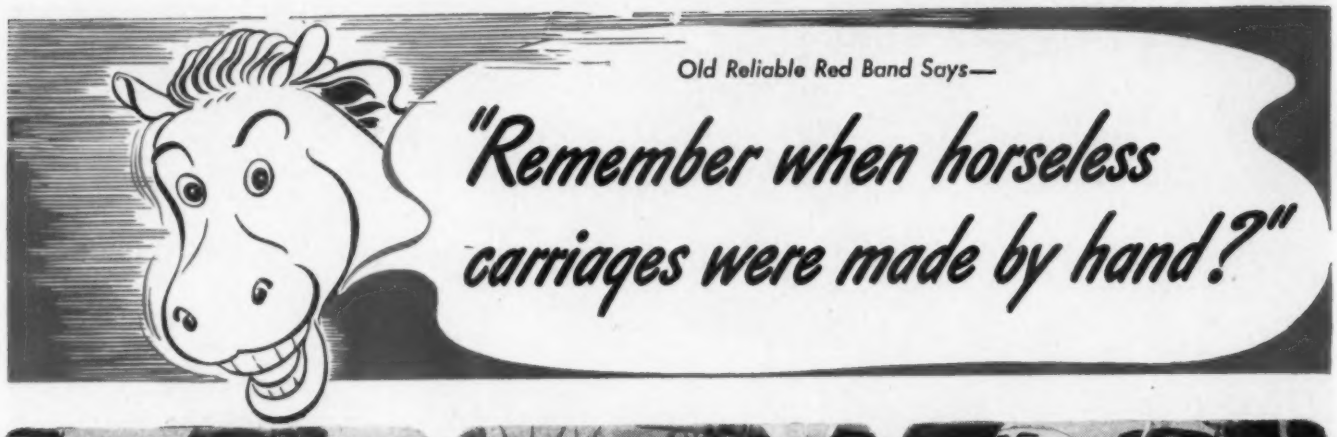
How the FAWICK AIRFLEX CLUTCH Works

Compressed air expands the rubber - and - fabric gland—to engage clutch with any degree of "grip" you want. Release the air and clutch disengages.

FAWICK

Air flex

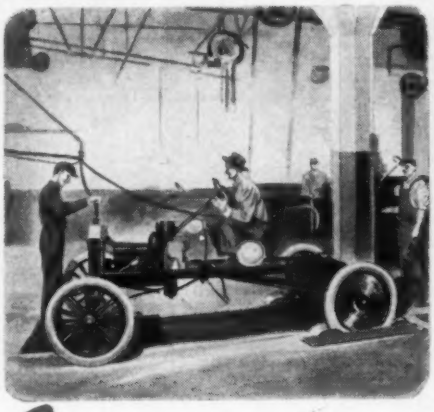
CLUTCH



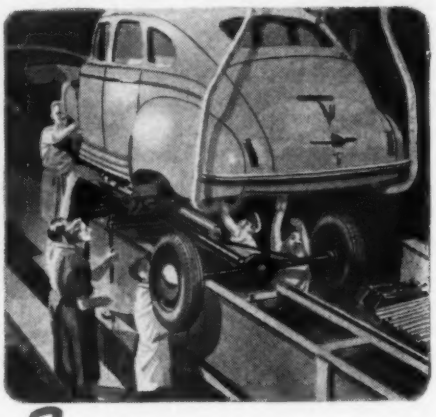
Old Reliable Red Band Says—

"Remember when horseless carriages were made by hand?"

1 **In 1897,** automobiles were put together with screw drivers and wrenches. Machine tools for the growing industry soon appeared. But parts made on these machines still had to be assembled by hand —it took a lot of "tinkering" to make them fit.



2 **In 1913** came the first moving assembly line—the forerunner of modern mass production. It eliminated the back-breaking labor of carrying parts from machine to machine, then to assembly point. Now, the work, not the man, progressed from operation to operation.



3 **Today,** electrical horsepower not only runs all assembly lines and conveyor systems, but also operates machine tools. Since 1915, Howell has specialized in making industrial type motors for these tasks in the automotive and many other industries.

Have you a <u>hard</u> job for Horsepower?

For *tough* jobs, an industrial type motor is just the ticket! For 30 years, we've been building Howell industrial motors to operate under the grueling conditions found in the automotive, machine tool, food, dairy and other important industries.

Howell Motors are first choice in a score of industries because: (1) They are precision-built of the finest materials, with copper or bronze rotors, and completely insulated. (2) They are smooth-operating – statically and dynamically balanced. (3) They are designed for the toughest tasks in industry – consequently they perform better on *all* jobs.

See the nearest Howell Representative for your needs in specialized or standard motors up to 150 h.p. Remember, you pay no more for industrial type Howell Motors—and always get top quality for your money.

Howell Protected Type Motors available in sizes 5 h.p. and smaller. Also other sizes of Howell industrial type motors available up to 150 h.p.

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Manufacturers of Quality Industrial Type Motors Since 1915

3 TYPES OF *Flexible* Connections ...each offers distinct advantages

1 Withstands Frequent Flexing

"American" *Helical* Seamless Flexible Tubing. Particularly well adapted to services involving frequent or constant flexing. Available unbraided or with single, double or triple "basket weave" wire braid, with or without reinforcing armor, and with or without fittings attached.

2 Aids Maintenance Men

"American" *Annular* Seamless Flexible Tubing. Each convolution is a complete and separate circle or ring in itself. Heat proof Reattachable Couplings (illustrated) can be readily attached and detached with standard shop tools. Ideal where assemblies must be made up "on the job."

3 For Moderate Pressures

"American" Strip-Wound Metal Hose is available in four popular types, some without packing, others packed with asbestos, cord, rubber or wire. Made in brass, bronze, galvanized or stainless steel and other workable metals. Used for carrying steam, water, oil, hot air, grinder dust, chips or light, dry material.

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METAL HOSE

THE AMERICAN BRASS COMPANY

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IN THOUSANDS of plants throughout the country, flexible connections of the types shown are safely and economically conveying oil, water, steam, gases and semi-solids. Engineered to absorb vibration, compensate for misalignment, or allow for movement of parts, such connections withstand heat, pressure, abrasion and corrosion. Detailed information? Write for Bulletin SS-50.

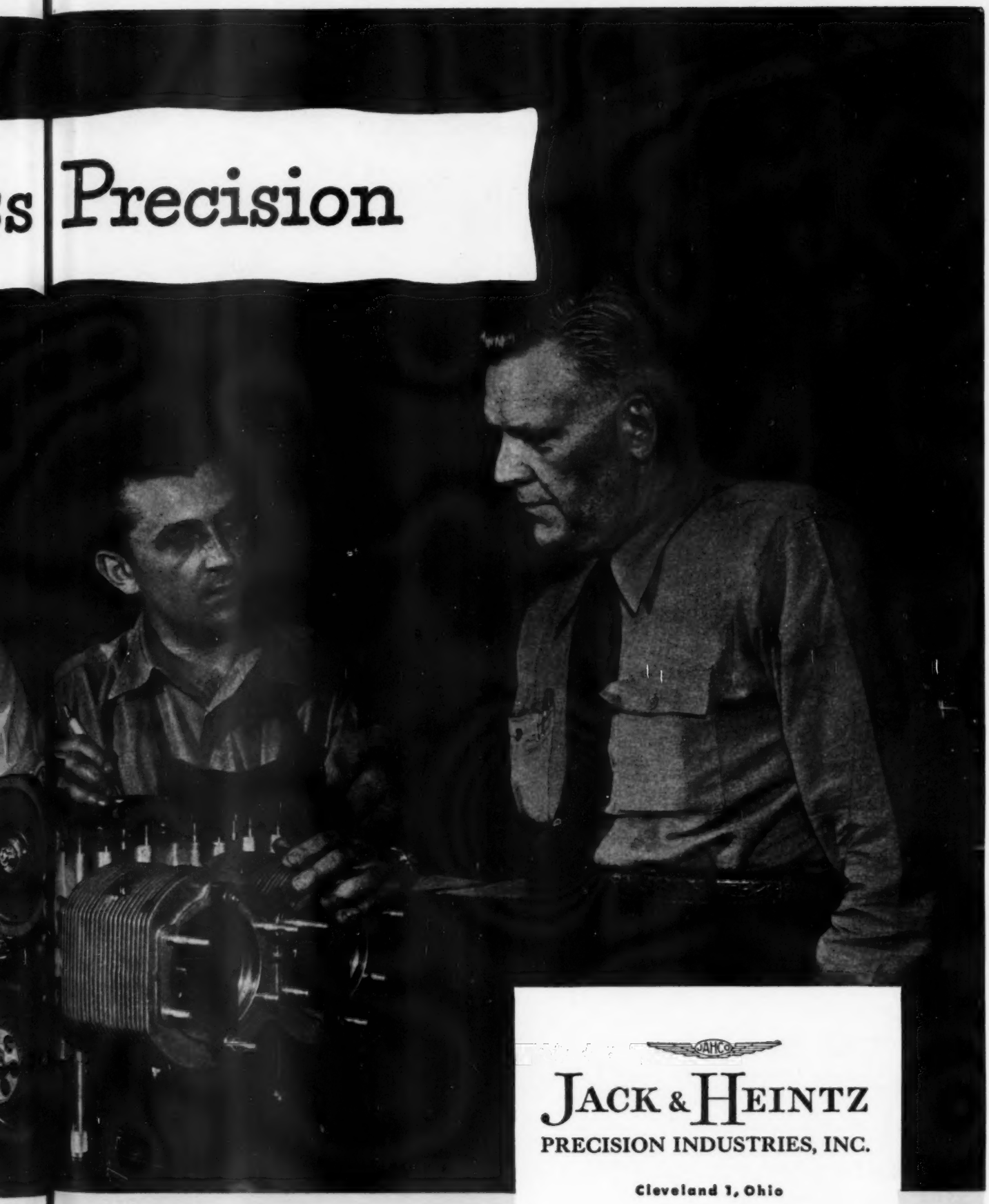
Engineering for Mass

...an achievement of Jack & Heintz

TEAMWORK

Working in an environment of rewarded initiative, Jack & Heintz engineers and craftsmen have developed a unique team spirit. Something new has been created in industry—8,000 workers, every one as enthusiastic, as determined to produce well and quickly as the managers themselves. Out of this enthusiasm and teamwork, has come a potent new engineering force. Jack & Heintz design engineers, development engineers and production engineers have created a new high standard of engineering coordination by which revolutionary designs and unheard-of *precision* have become *mass-production* realities. This combination . . . *engineering for mass precision* . . . created high-precision products by the millions to help win the war. This same teamwork . . . *engineering for mass precision* . . . is here today at Jack & Heintz as clearly, as forcefully as in the heat of war and it always will be. *And you can expect it in startling Jack & Heintz developments tomorrow.*

● MANUFACTURERS OF MOTORS, BEARINGS, AIRCRAFT ACCESSORIES,



JACK & HEINTZ
PRECISION INDUSTRIES, INC.
Cleveland 1, Ohio

ELECTRONIC GAUGES AND MAGNETOS

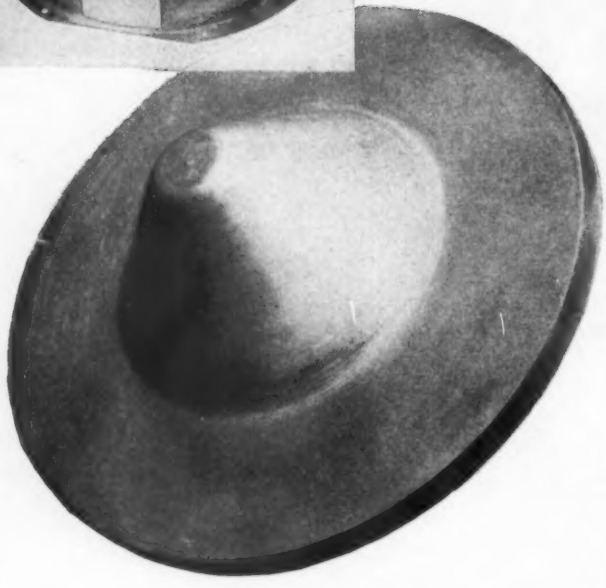
A METAL SPINNING

(Dimensions ¼ inch thick to 10 feet diameter, in any shape)

MAY BE THE ANSWER TO YOUR "IMAGINEERING"

●Did you know that intricate metal shapes can be spun in any quantity — one or thousands — yet even in small quantities tool costs are negligible?

Did you know that copper or aluminum to ½" thick and stainless or Monel to ¼" thick can easily be spun to any specifications?



As pioneers in the spinning technique, we can assist in meeting most requirements for experimental parts and production runs. Our highly skilled craftsmen produce spun parts to micrometer specifications. Our engineering department is at your service to help in solving your metal working problems.

Facilities for deep drawing—including a 400 ton hydraulic press.

Write for illustrated literature—see photographs of some "idea inspiring" spinnings.

WILLIAM BERGFELS & CO.
25 ORCHARD ST., NEWARK 2, N. J.

BERCO PRODUCTS SINCE 1872

Metal Spinning

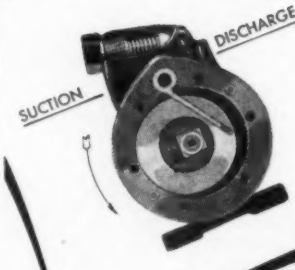
TO EXACT TOLERANCES . . . IN STAINLESS STEEL, MONEL METAL, ALUMINUM, COPPER AND ALL DUCTILE METALS

For Positive Lubrication

use Rollway Pumps

● For your lubrication jobs, you'll do well to consider slow speed, positive displacement Rollway Pumps. They're rotary pumps which assure you of *full capacity* all the time. They may be set considerably above the liquid *without danger of loss of prime.* They are available in standard models with capacities of 1 pint to 60 gallons per minute, as reversing or non-reversing, and with or without built-in relief valves.

NEVER WEARS OUT



Simplicity itself! The roller does not revolve. Rather, it floats and is not subject to rotary friction which causes wear. Slip spring keeps pump tight, retains its vacuum.

PIONEER Pumps
SEAL TYPE, SEAL-LESS AND ROLLWAY
FOR PUMPING COOLANTS • CUTTING FLUIDS
ABRASIVE LIQUIDS • LUBRICANTS • WATER

Pioneer Pump & Manufacturing Co.
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it's the SIDEWALL of a V-Belt that Gets *ALL* the *WEAR* –

–That's Why the CONCAVE SIDE *is IMPORTANT!**

V-Belt
In Sheave
Clearly, it's the sides of a V-Belt that do all the gripping on the pulley and get all the wear against the sheave-groove wall. That's why longer life for the sides means longer life for the belt!

Every man who works around V-Belt driven machines knows from experience that it is nearly always the *sidewall* of a V-Belt that *wears out first.*

There is a perfectly natural reason why the wearing out starts with the sidewall—and here it is—

It is the *sidewall* of a V-Belt that has to *grip* the pulley and drive it. It's the sidewall that *transmits* to the pulley all the power the pulley ever receives. No other part of the belt gets anything like the *actual* wear the sidewall gets. Is it any wonder the sidewall of the *ordinary* V-Belt is the part that wears out first? Clearly, then, prolonging the life of the sidewall is the *one thing needed* to prolong the life of the belt!

The simple diagrams on the right show clearly why the ordinary, *straight-sided* V-Belt gets excessive wear along the *middle* of the *sides.* They show also why the Patented Concave Side *greatly reduces* sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight sided V-Belts can possibly give.

THE GATES RUBBER COMPANY
DENVER, U. S. A.
World's Largest Makers of V-Belts

Gates
THE MARK OF SPECIALIZED RESEARCH

469

*Even *MORE* Important *NOW***
with Rayon Cord and Other *Stronger Tension Members*

Now that Gates Specialized Research has resulted in V-Belts having much stronger tension members—tension members of Rayon Cords and Flexible Steel Cables, among others—the sidewall of the belt is often called upon to transmit to the pulley much heavier loads. Naturally, with heavier loading on the sidewall, the life-prolonging Concave Side is more important today than ever before!

Straight Sided V-Belt

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall

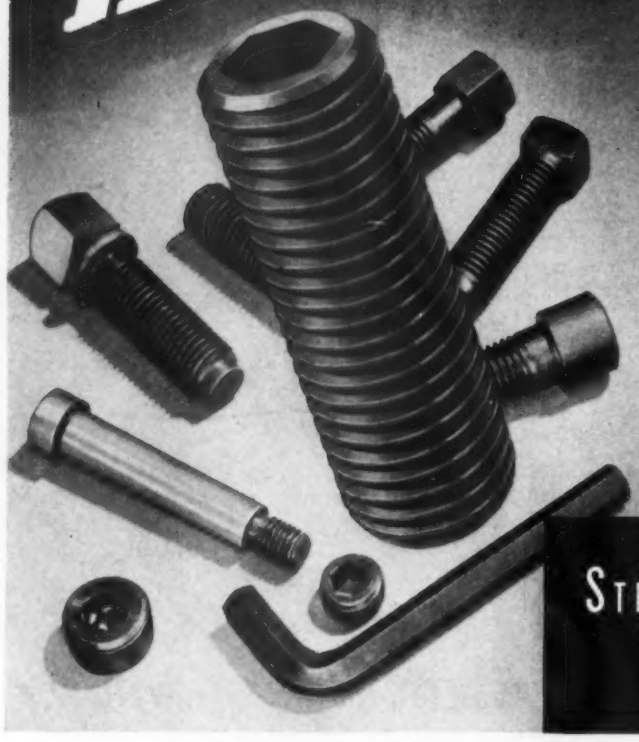
Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley

No Bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks **IN ALL INDUSTRIAL CENTERS** **of the U. S. and 71 Foreign Countries**

Mac-it ALLOY STEEL SCREWS



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Mac-it Hollow Set Screws will solve your toughest holding-down problems where flush surfaces, compact construction and a neat appearance are factors. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

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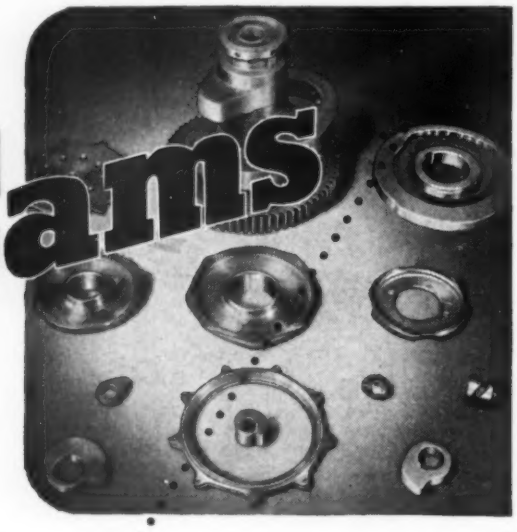

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PULL

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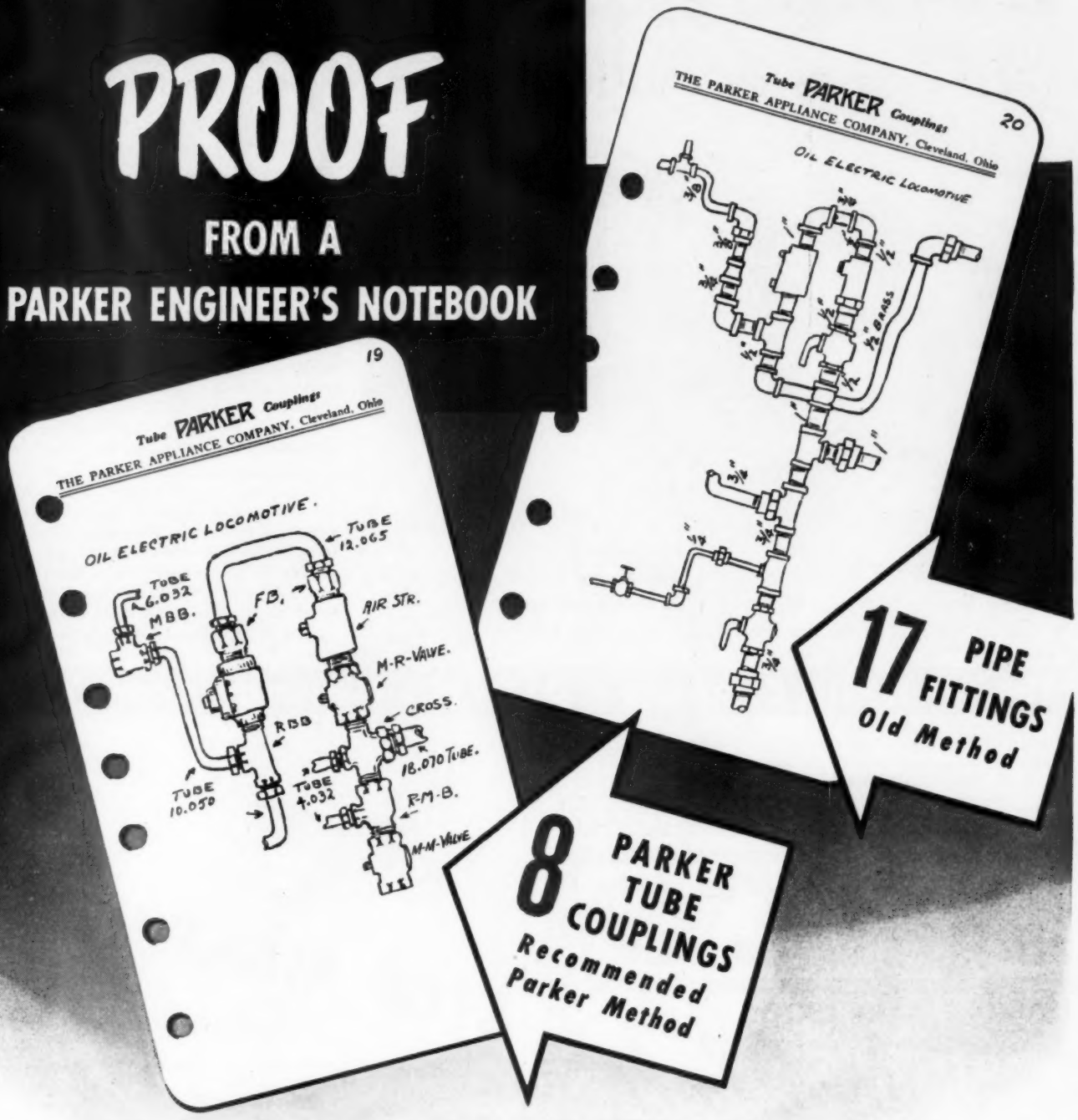
FROM A PARKER ENGINEER'S NOTEBOOK



Better than a two-to-one advantage from the standpoint of number of connections, alone!

But that's only *one* advantage of Parker Fluid Power Engineering. Take the actual case pictured: the circuit is more compact, more efficient, cleaner (because there are no sealing compounds or pipe threading operations), and it's vibration-proof, too.

Every Parker fitting is a *coupling*—easy to disassemble without disturbing the circuit or using gaskets and compounds. You'll save time, money and materials at every stage.

May we show you how Fluid Power can be engineered to your requirements?

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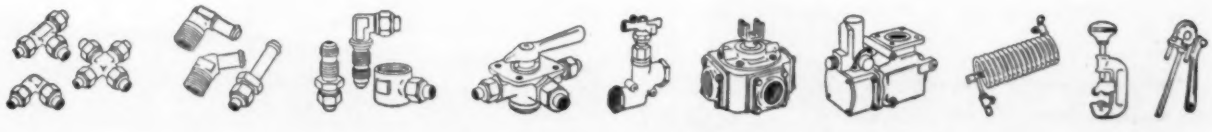
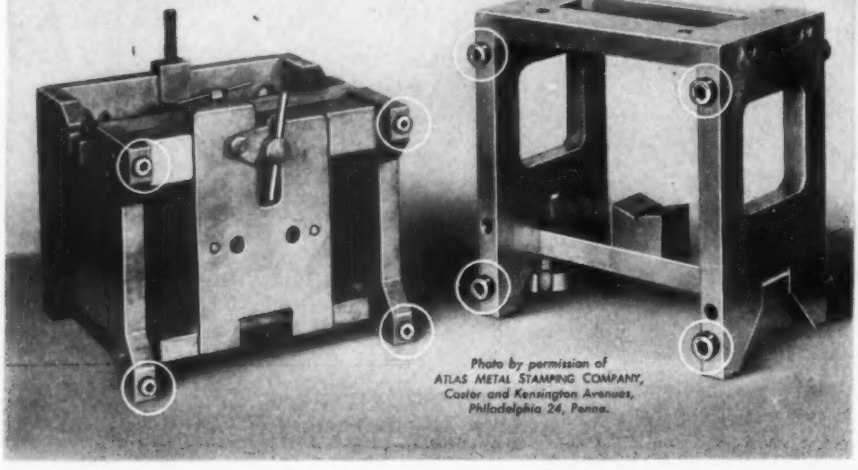
Standard Parker valves and couplings are built in sizes to cover a wide range of exacting conditions—stocks are available at your distributors and at Parker warehouses.



ALLEN Socket Head Cap Screws

ALLEN HEAD used as jig and fixture feet



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Ready-at-hand for the toolmaker's use, — *ready-made* except for grinding for squareness, as required in using any other type of feet on jigs or fixtures. Save the time and expense of making *special* feet.

ALLEN

SOCKET HEAD CAP SCREWS

have the hardness for long wear, but not a degree of hardness subject to cracking. Being replaceable — as special feet often are not — they can be dressed at trifling cost as compared with expense of repairing cracked or broken feet. Handiest, cheapest safeguards against tie-ups in high-production work... Available in *standard sizes* for jig and fixture feet, as well as for all general tool and die work.

"Allens" have the *clamping-power* for the firmest of set-ups. Their strength is gained by *pressur-forming* of special-analysis ALLENOY steel, which makes the steel fibres conform to the shape of the screw head. In the perfectly-formed hex sockets, the keys bear evenly and equally on all surfaces. Threads are also *pressur-formd* to a high Class 3 fit, for the maximum of frictional holding-power in the tapped hole.

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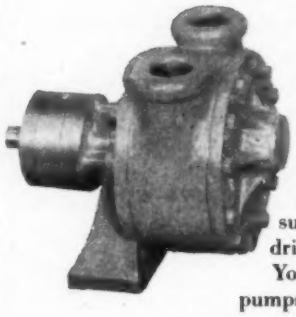

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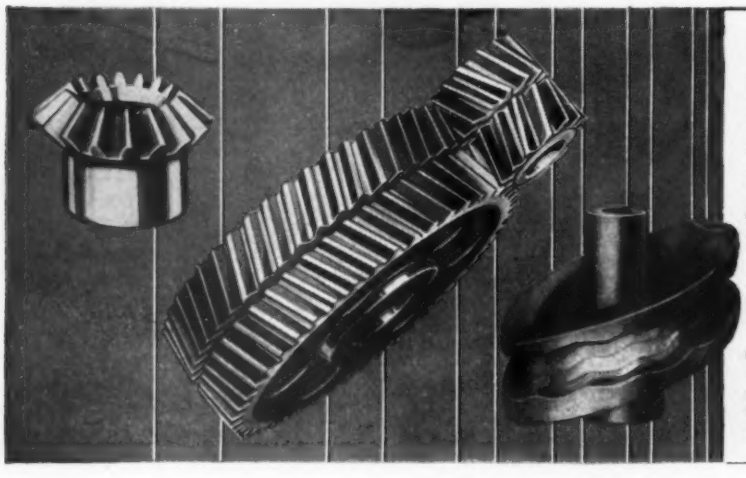

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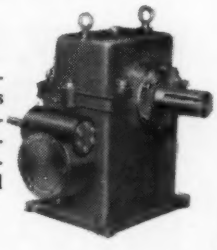

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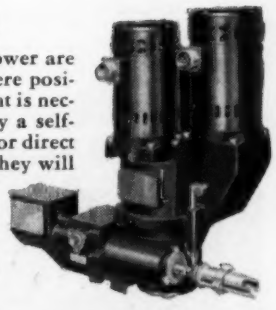

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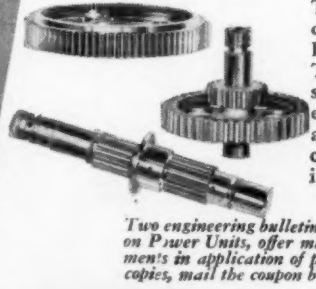

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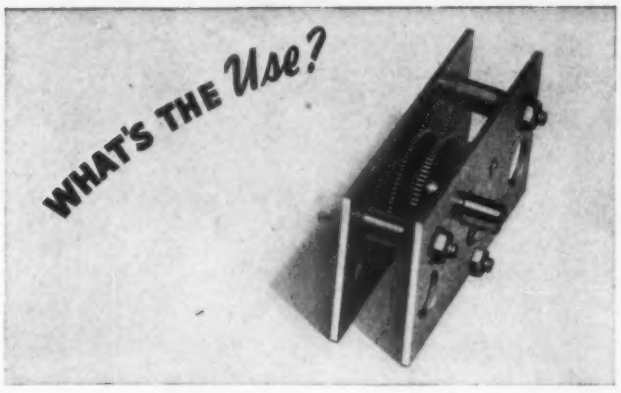

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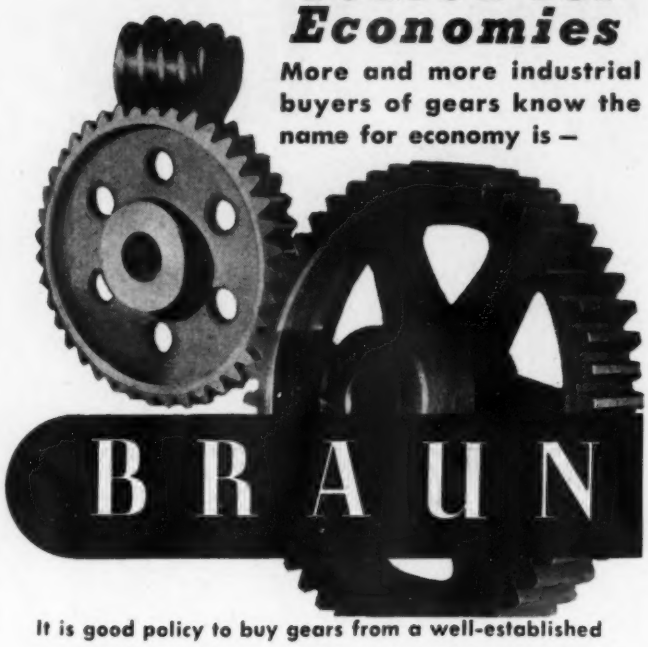

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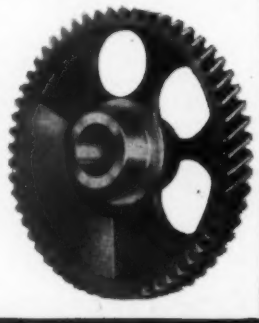

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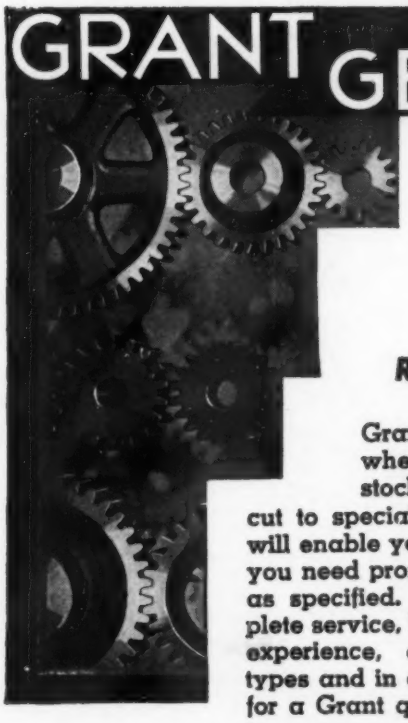

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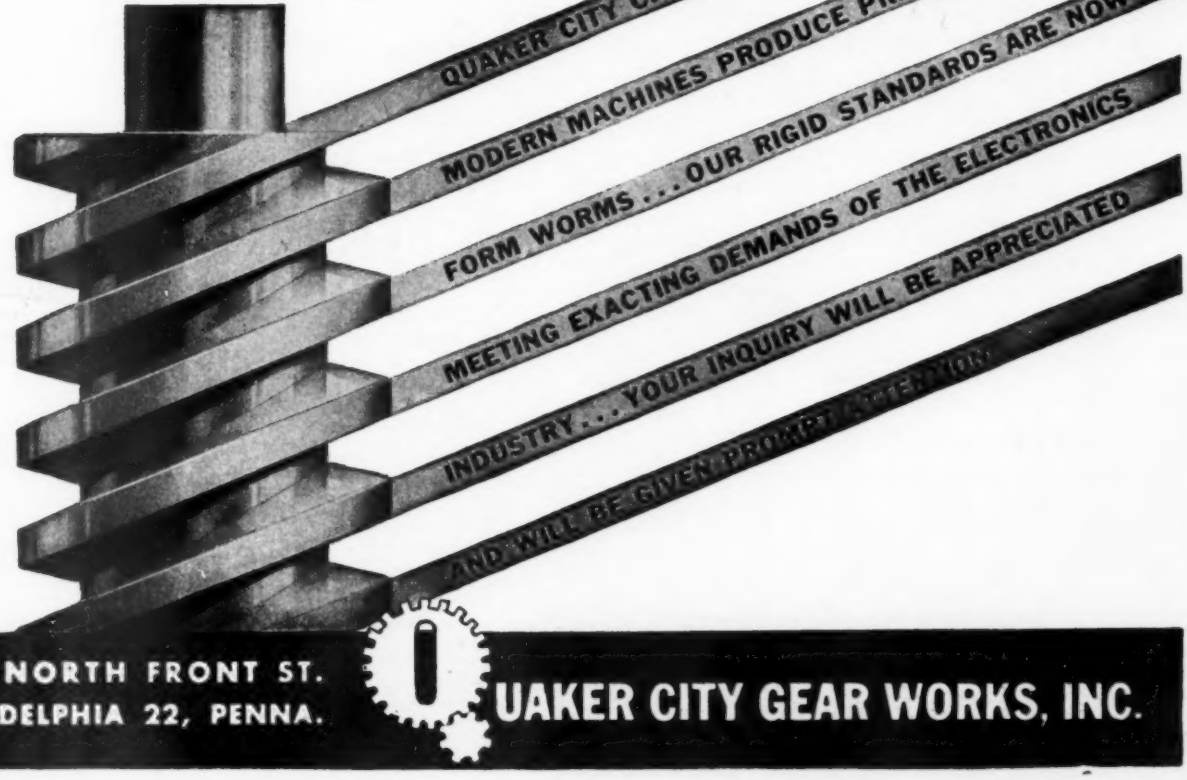
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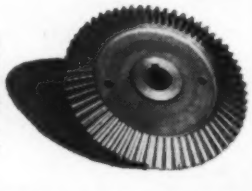

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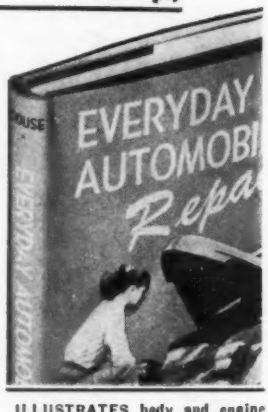

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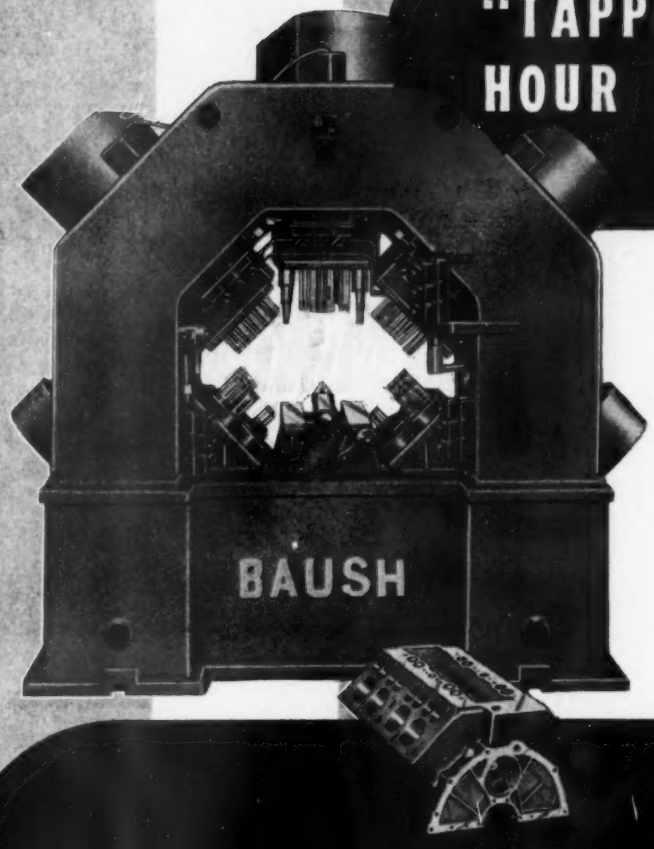

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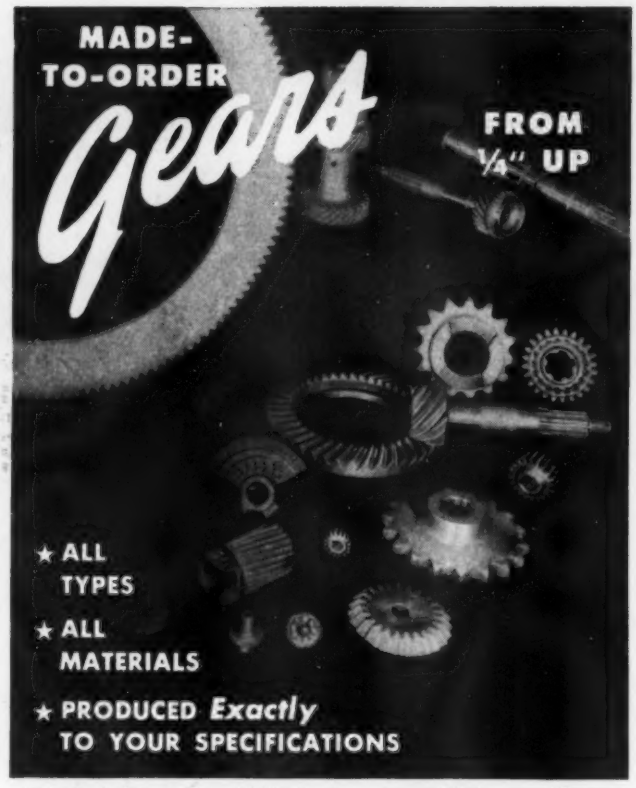

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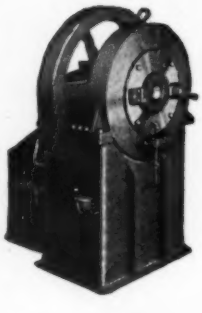

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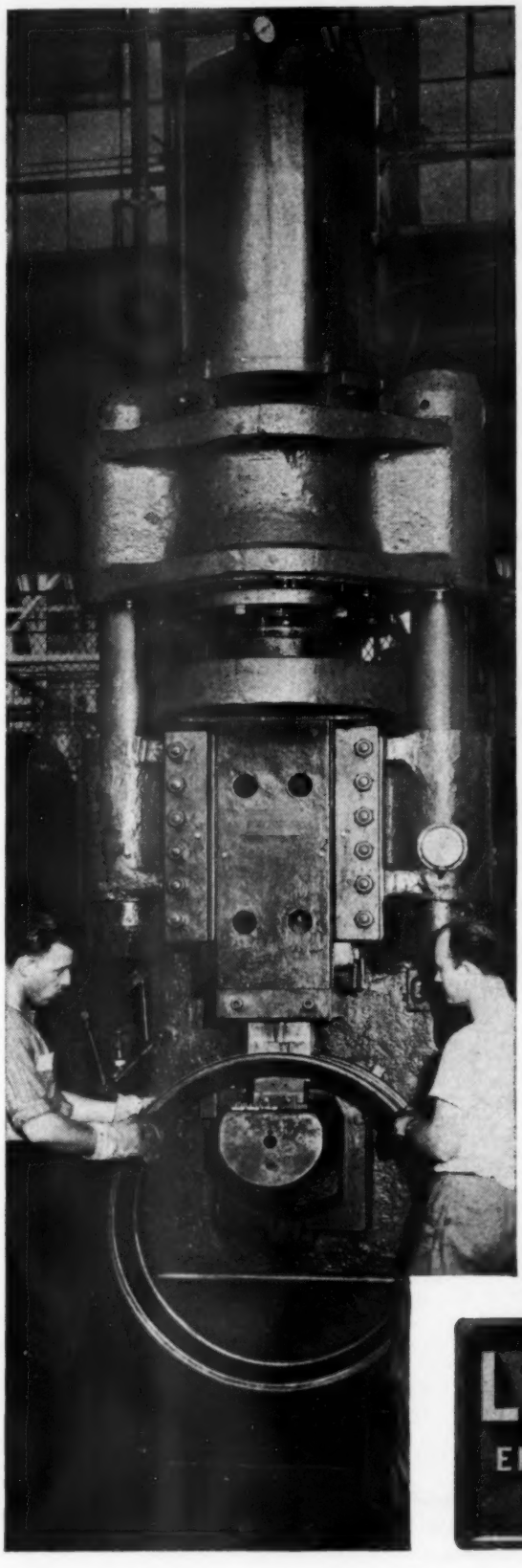

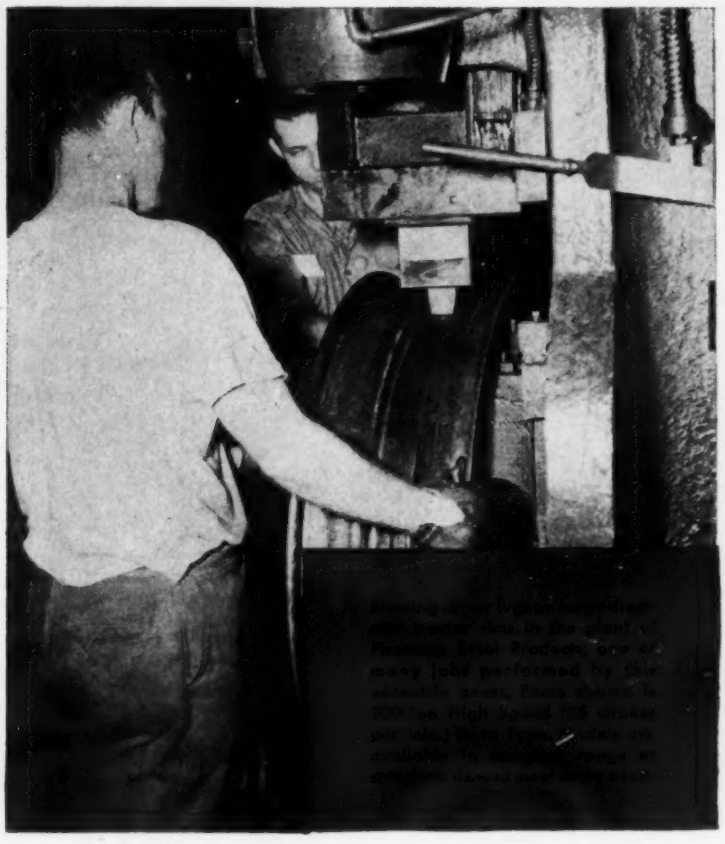

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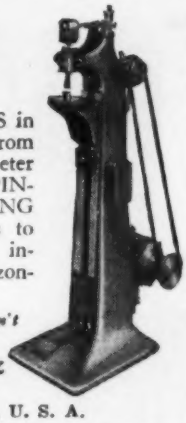

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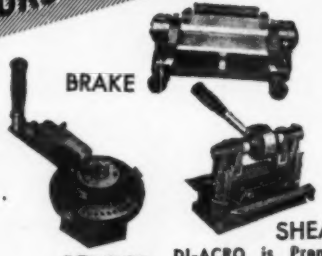

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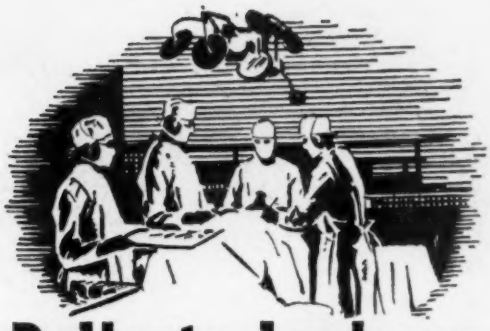

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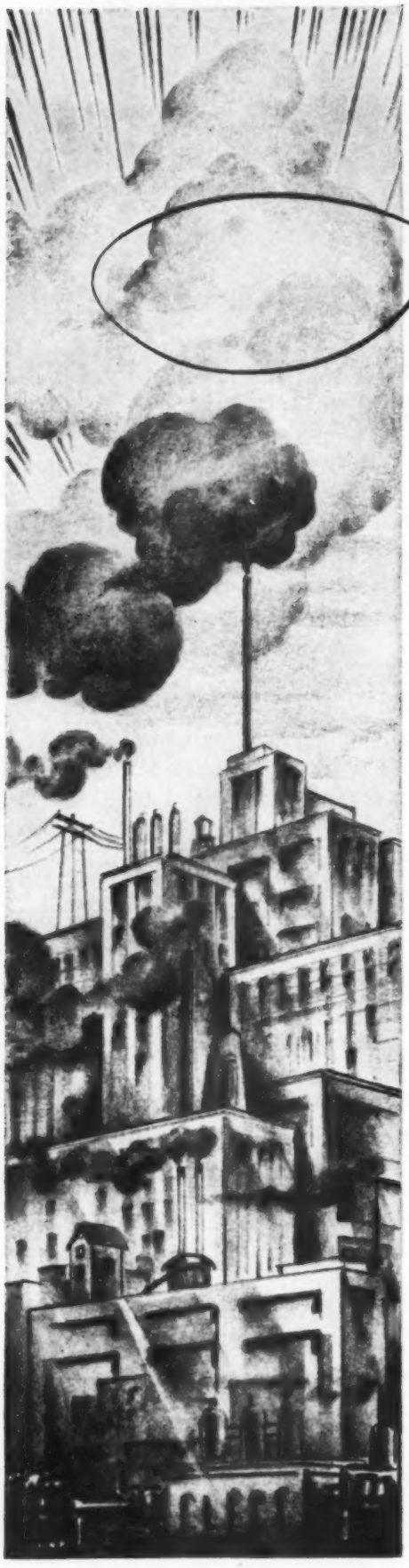

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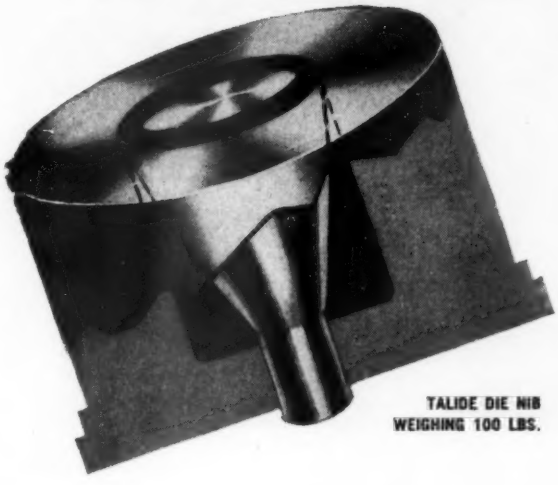

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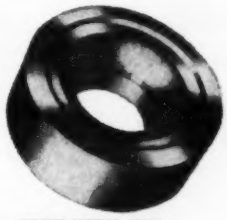

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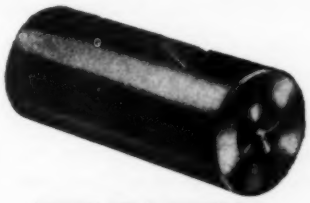

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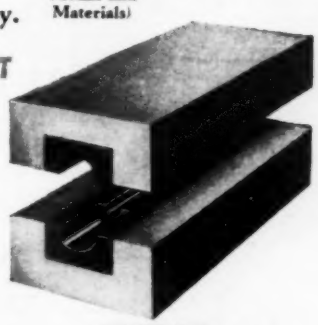

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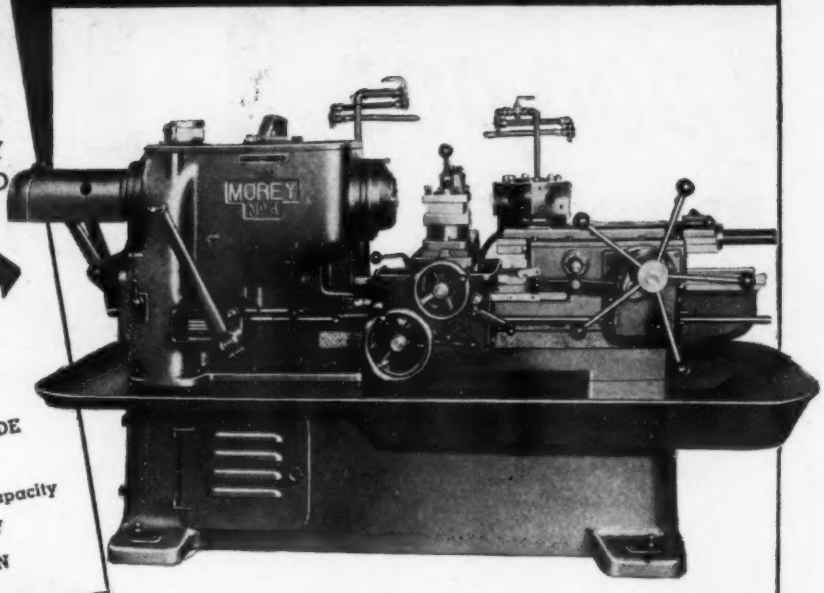

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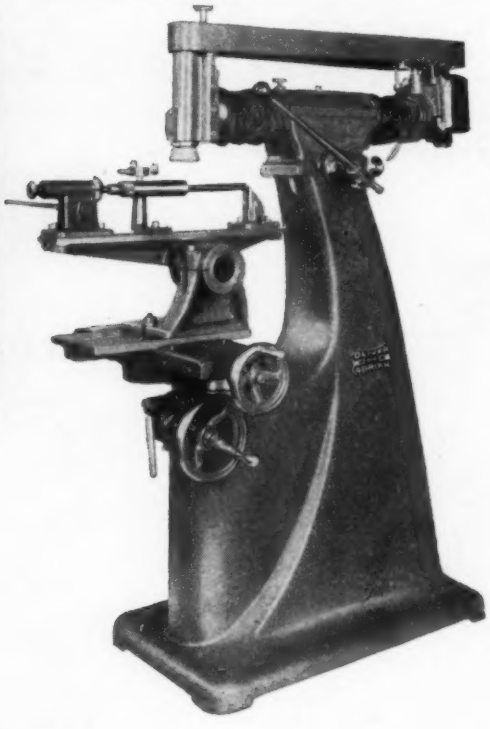

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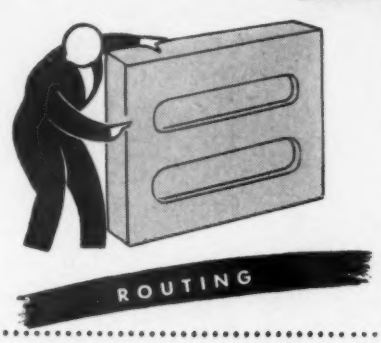

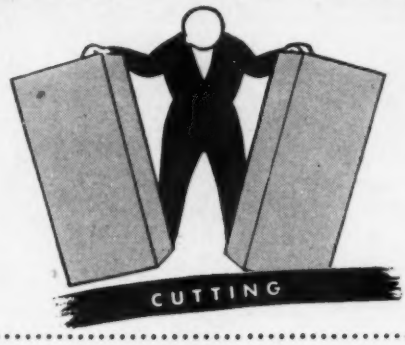

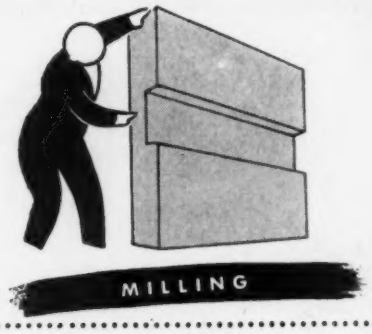

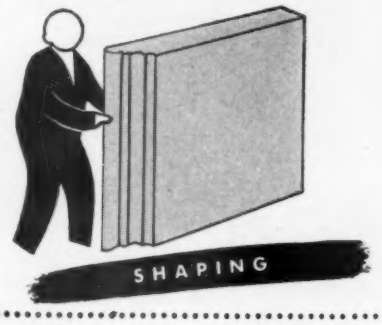

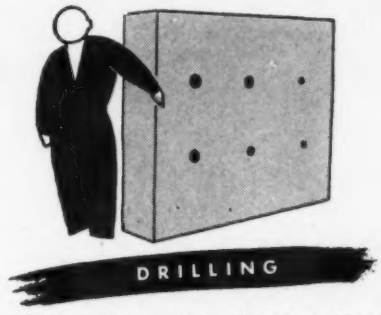

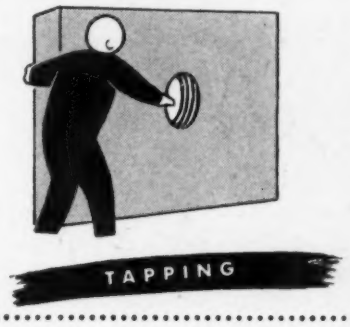

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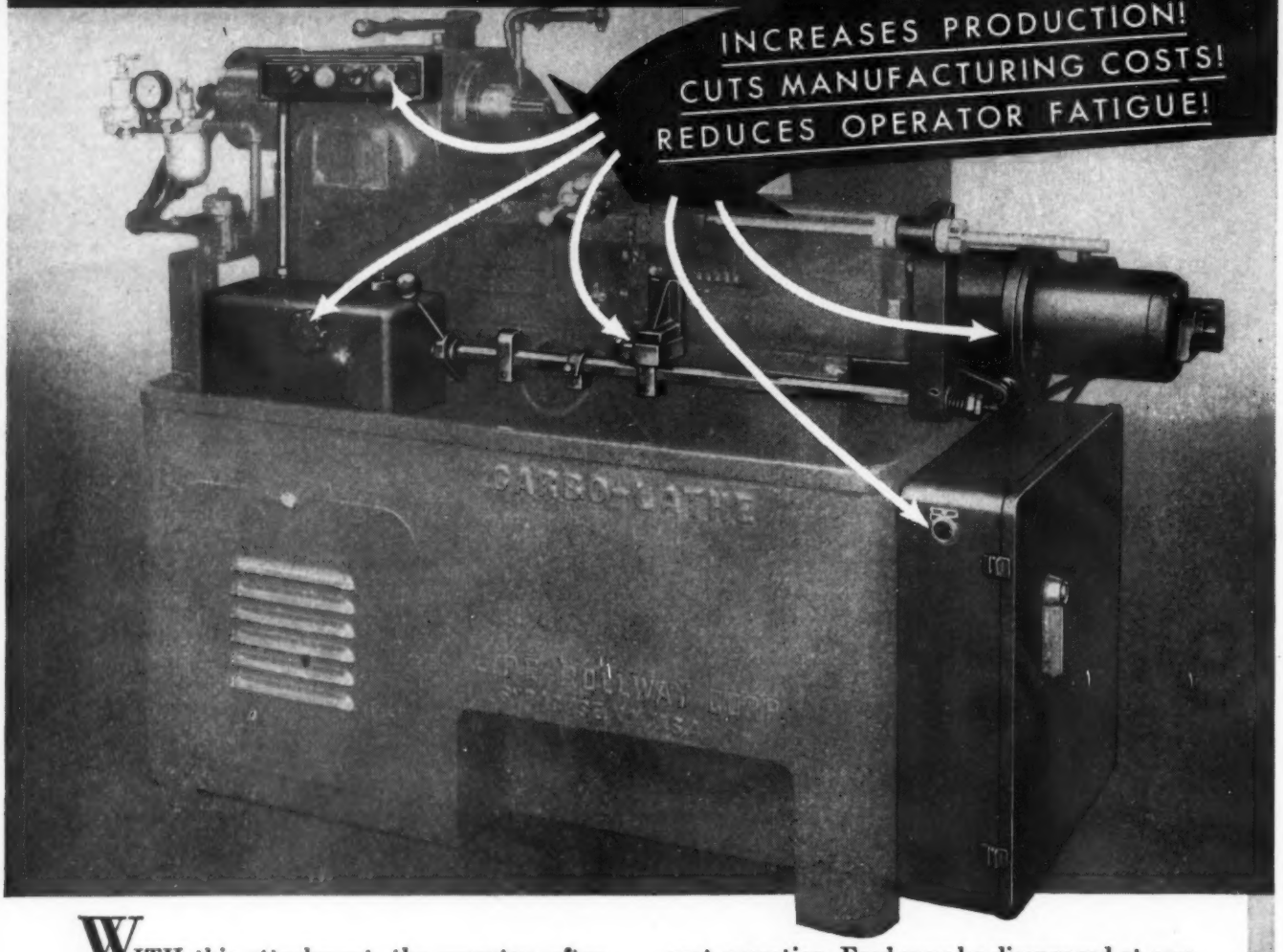

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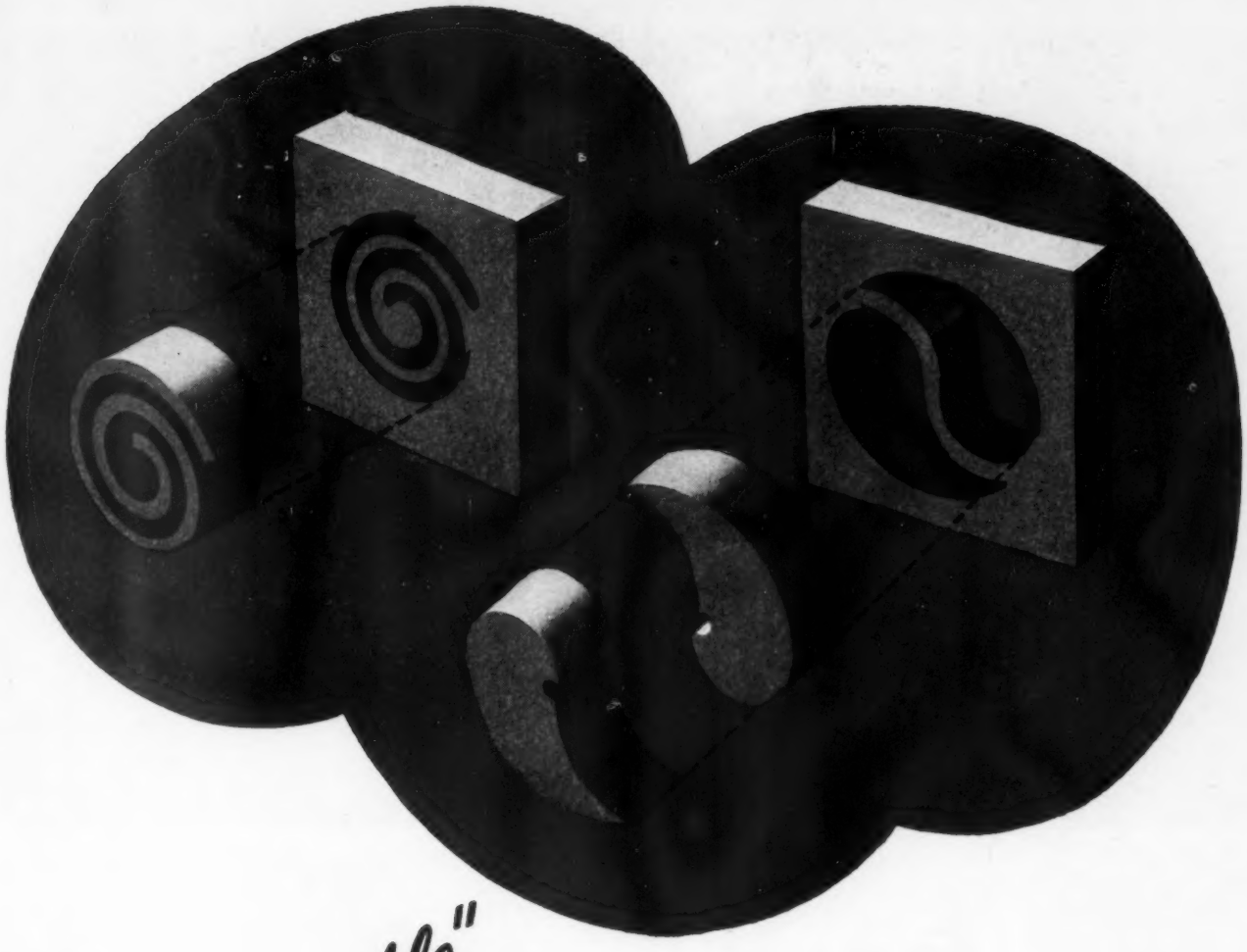
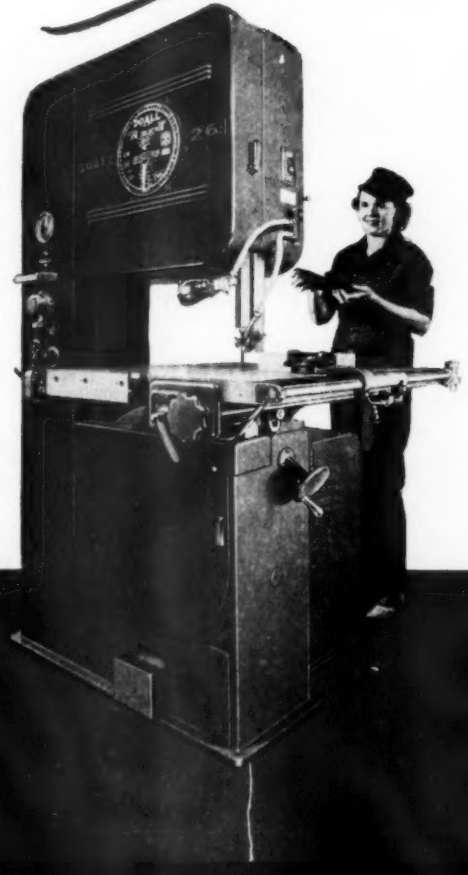
LIPE automatic complete cycle attachment may be applied to any LIPE mechanical carbo-lathe bearing a serial number of 200 or greater, and may be used with either plain or taper turning type front carriage.

Complete installation instructions and prints are furnished with each unit, or the services of one of our factory men may be secured for a nominal fee. For further information contact nearest distributor in your territory.



THE "Impossible" WITH DoALL CONTOUR SAWING

- *Miracle Method of Low-Cost Production*
- *World's Fastest Metal-Removing Process*



No metal-cutting process except Contour Sawing can do these two jobs, leaving cutouts and leftover stock intact. Other metal-cutting processes waste time reducing stock to worthless chips. Contour Sawing slices stock; leaves only a 1/16-in. kerf. Hundreds of superhard, razor-sharp teeth on a narrow band cut continuously through hard, tough metals as much as 30 in. thick. Apprentices soon do expert work—do not need years of experience.

Contour Sawing is an entirely new approach to low-cost production. Jobs done slowly by other methods are "naturals" for fast Contour Sawing. It magically reproduces parts usually cast or forged; turns out shop jigs and fixtures; makes cams; cuts sheet-metal stampings; patterns and templates.

Advantages of Contour Sawing shown in free booklet *"DoALL Equals Ten Plus"*. Write for one if you want to see production zoom and costs sag!

DoALL

Here's how Falk Steelflex Couplings completely protect connected machinery

from *Shock...* *Vibration...Misalignment*

Only Falk Steelflex Couplings provide all three: Flexibility, Torsional Resilience* and Applicability to 90% of all industrial requirements.

These three factors are important to the coupling buyer. They offer him positive protection to connected machinery . . . the certain solution to applications where shock loads, misalignment and vibration are problems . . . and the opportunity of stocking one type of coupling to meet practically all of his coupling requirements, quickly and conveniently.

How Falk Steelflex Couplings are designed and produced to provide these factors is important. The diagrams on the opposite page explain how the Falk "grid-groove" design functions to protect machinery against ordinarily damaging conditions . . . how it compensates for parallel and angular misalignment and permits free end float.

A simplified method for selection, load classifications, service factors and dimensions is available to you in a booklet. You are enabled to meet your requirements dependably, quickly —with a reduced parts inventory.

In addition to the standard Type "F" which is applicable to more than 90% of all installations, Falk offers a line of large Steelflex couplings and couplings featuring the Steelflex principle but used for special service and dual-purpose applications.

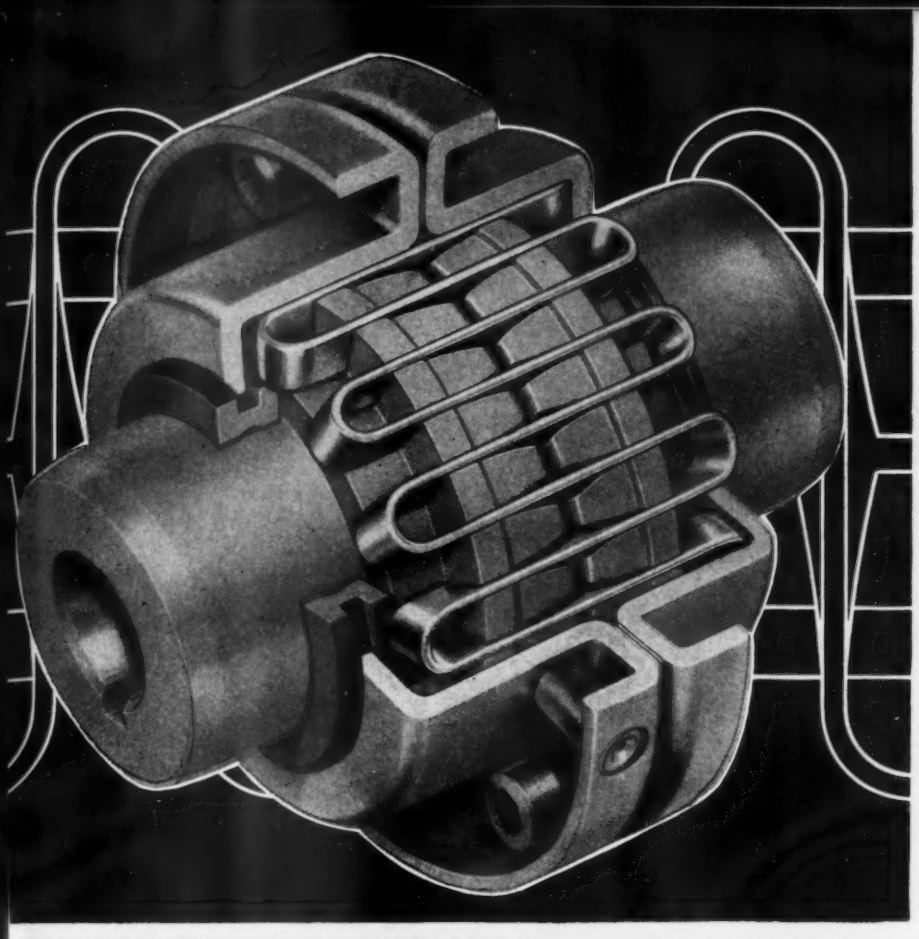
Get the complete information on Falk Steelflex Couplings either from your Falk representative or distributor, or write to Falk.

*** Torsional Resilience is the ability to spread the peak or shock loads over a relatively long increment of time, thereby greatly reducing stresses in the connected machinery.**

THE FALK CORPORATION

MILWAUKEE 8 WISCONSIN

For over fifty years precision manufacturers of Speed Reducers . . . Motoreducers . . . Flexible Couplings . . . Herringbone and Single Helical Gears . . . Heavy Gear Drives . . . Marine Turbine and Diesel Gear Drives and Clutches . . . Steel Castings . . . Contract Welding and Machine Work. District Offices, Representatives, or Distributors in principal cities.



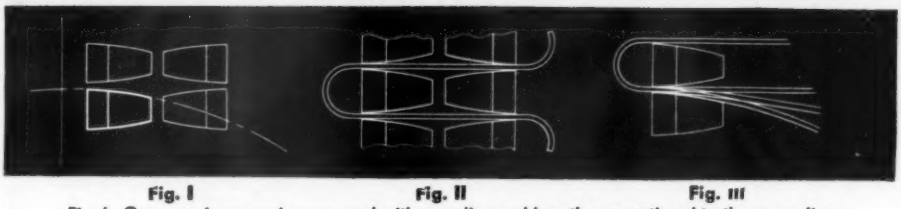


Fig. I Fig. II Fig. III

Fig. I. Grooves, in a precise arc, and with a radius and length proportional to the capacity of the coupling, are cut into two identical hubs of moderately high carbon steel—forged of Falk alloy cast steel . . . Fig. II. These grooves provide a slot for a grid member made of chrome alloy steel with an elastic limit of 180,000 pounds per square inch and an ultimate strength of 220,000 pounds per square inch . . . Fig. III. This grid fits snugly into the curved grooves cut into the hubs of the coupling. The grooves provide a scientifically cut bearing surface for the grid. This bearing surface extends from the outer to the inner edge of the grooves. The grid bears on the grooves in proportion to the load . . .

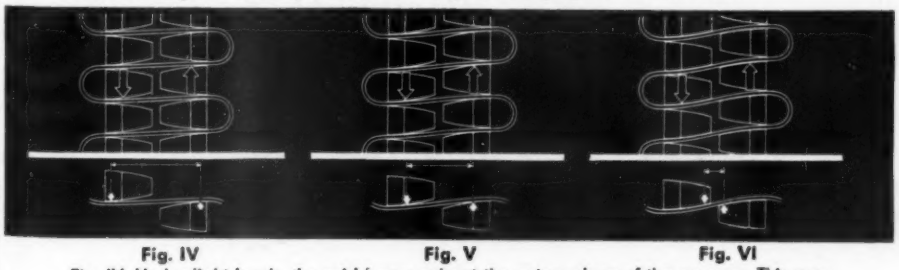
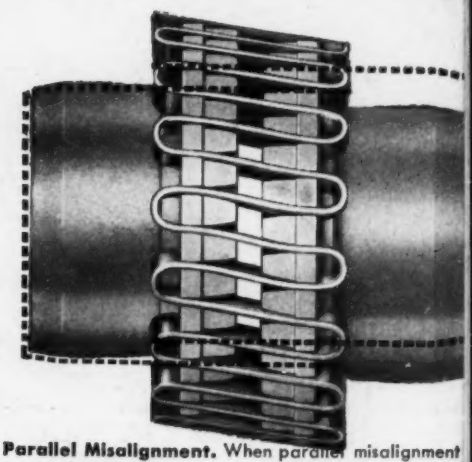
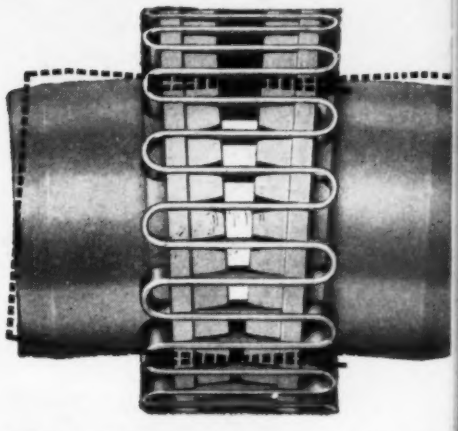


Fig. IV Fig. V Fig. VI

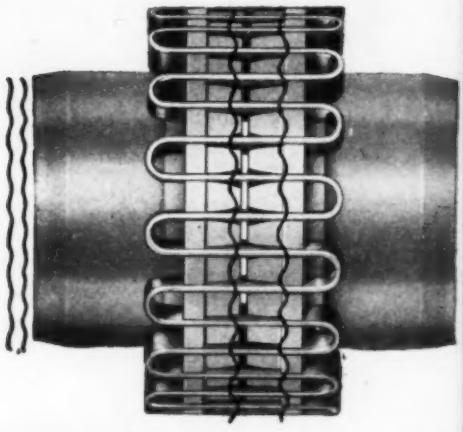
Fig. IV. Under light loads, the grid bears only at the outer edges of the grooves. This permits a long, free, elastic span between the outer edges of both hubs. Power is transmitted through almost the entire length of the grid rung . . . Fig. V. Under normal loads, the grid bears on a larger area of the grid grooves and the span of the grid run is shortened. It transmits more power and maintains its capacity to absorb shocks and dampen vibration . . . Fig. VI. Under peak loads, the grid rungs bear over almost all of the curved surfaces of the grooves. The span of the grid rung becomes very short. Under the impact of shock loads the grid flexes and continues to transmit power smoothly.



Parallel Misalignment. When parallel misalignment involved, the grid-groove combination comes into f play. The movement of the grid in the lubricated groov accommodates the misalignment, while still permittin full functioning of the grid-groove action of the couplin in absorbing shock and dampening vibration.



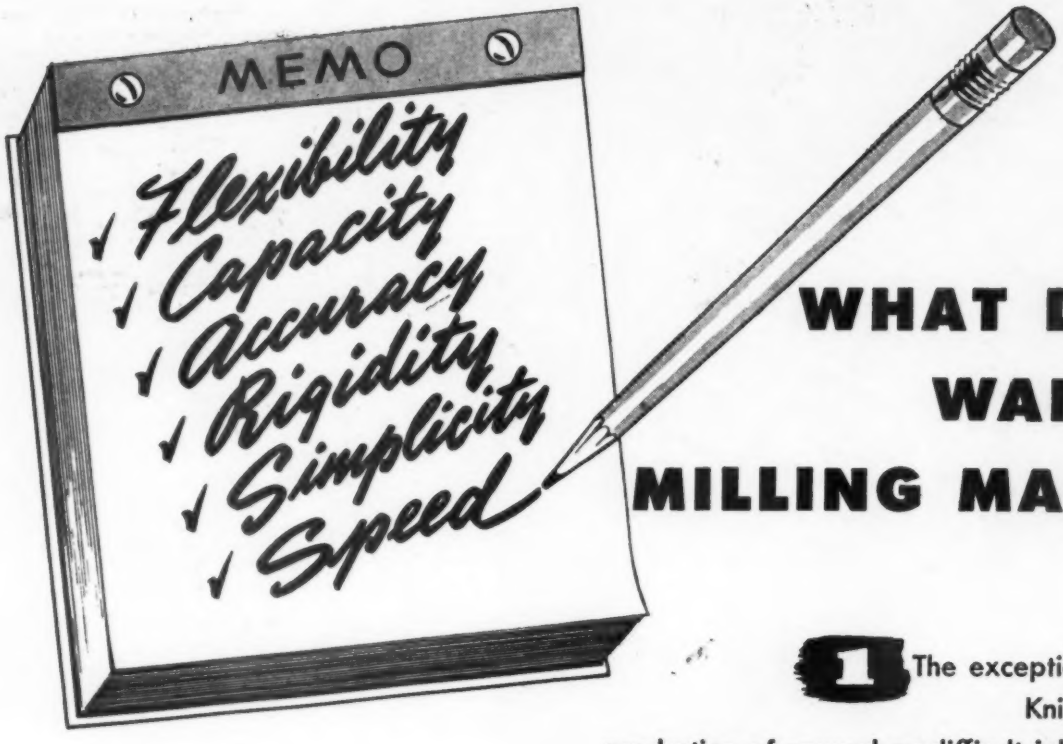
Angular Misalignment. Under angular misalignm the design of the Falk Steelflex Coupling permits a ro ing and sliding action of lubricated grid and hubs t allows the greatest freedom of accommodation angular misalignment, while at the same time transmitt the power through the resilient grid.



Free End Float. Because the grid member slides fr in the lubricated grooves, the Steelflex coupling pe unrestrained end float for the shafts of both the dri and driven members, or of either one. If it is desired end float be restricted, provision can be made to it to any required amount.

FALK

...a good name in industry



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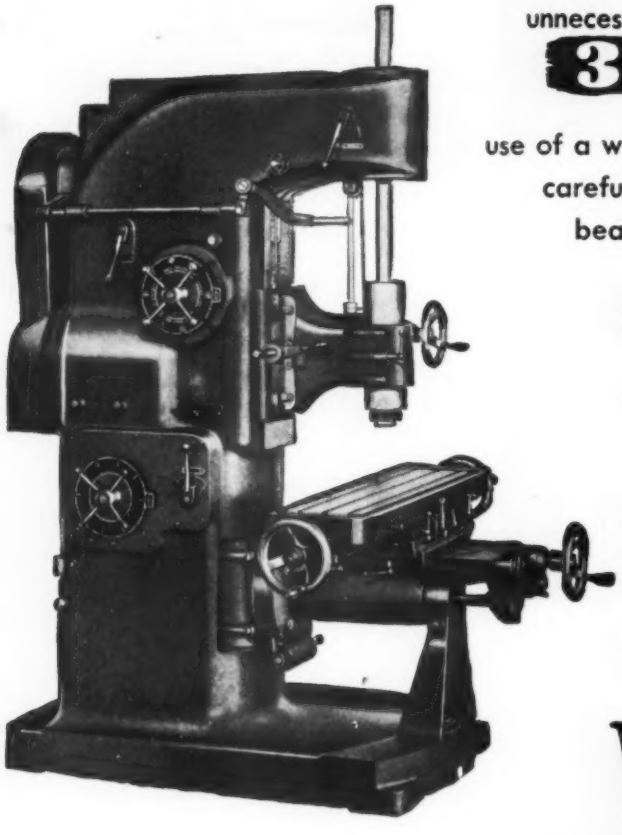
1 The exceptional adaptability of Knight Millers simplifies production of unusual or difficult jobs that often require two or more special machines... **2** Its tilting, swiveling table makes expensive special jigs, angle plates or other fixtures unnecessary for complicated milling, boring or shaping jobs... **3** Its sixteen table and spindle feed changes, and four different vertical spindle feeds, provide for the use of a wide range of various size cutters... **4** Its strong, carefully engineered one-piece column casting, wide accurate bearings, precision gearing and rigid supports promise accuracy, effortless operation and long service... **5** Its easy operating controls for direction, speeds and feeds, properly located for full vision and convenience, save time and boosts production.



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MACHINERY COMPANY

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To help increase "Take-Home Savings"

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"Peacetime Payroll Savings Plan" for key executives offers helpful suggestions on the conduct of the Payroll Savings Plan. In addition, it quotes leaders of Industry and Labor and their reasons for supporting the Plan.

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See your Payroll Savings Plan through to maintain your share in America's future. It is sound economics and a powerful force for good today—and tomorrow—as a safeguard for stability and a reserve of future purchasing power—money that is kept within your community.

The Treasury Department acknowledges with appreciation the publication of this message by

American Machinist

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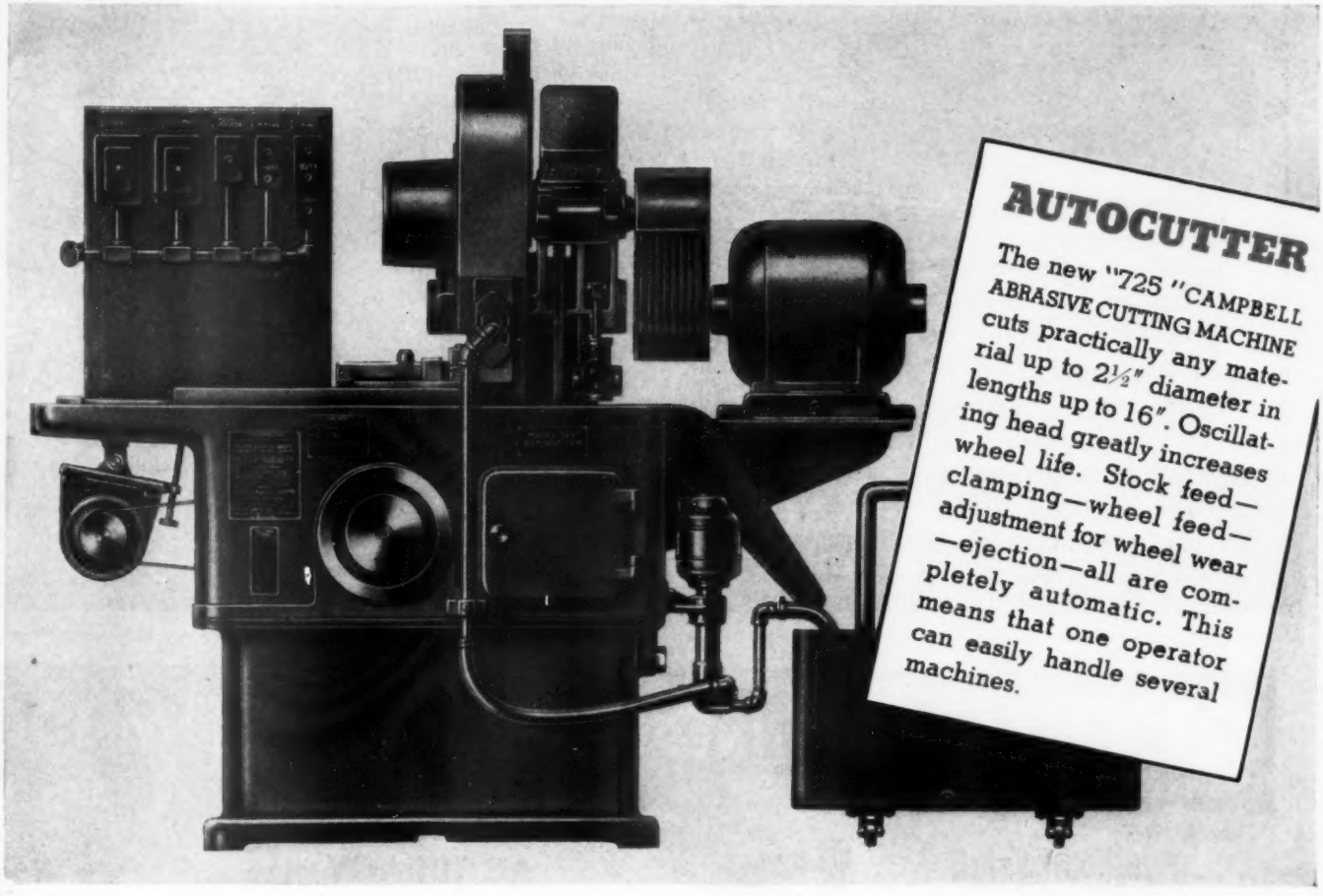
CUT PRODUCTION COSTS


AUTOCUTTER
The new "725 "CAMPBELL ABRASIVE CUTTING MACHINE cuts practically any material up to 2½" diameter in lengths up to 16". Oscillating head greatly increases wheel life. Stock feed—clamping—wheel feed—adjustment for wheel wear—ejection—all are completely automatic. This means that one operator can easily handle several machines.

Send for your copy of this file-size catalog folder. Ask for DH-1315.

CAMPBELL MAKES A FULL LINE OF ABRASIVE CUTTERS. IF YOU HAVE A CUTTING PROBLEM:

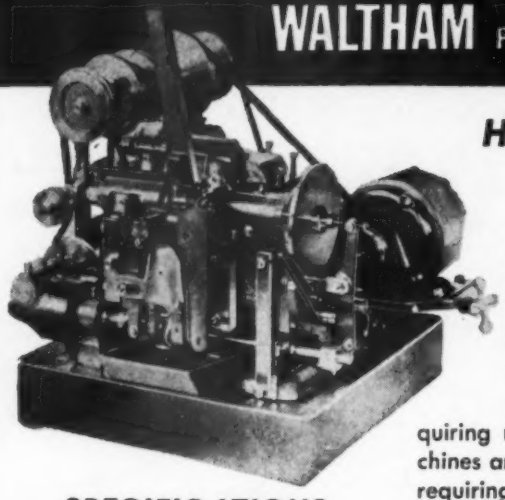
Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information, CAMPBELL engineers can recommend production procedure and work up cost sheets for you.

ACCO

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
AMERICAN CHAIN & CABLE • BRIDGEPORT CONN.

WALTHAM PINION & GEAR CUTTING MACHINES

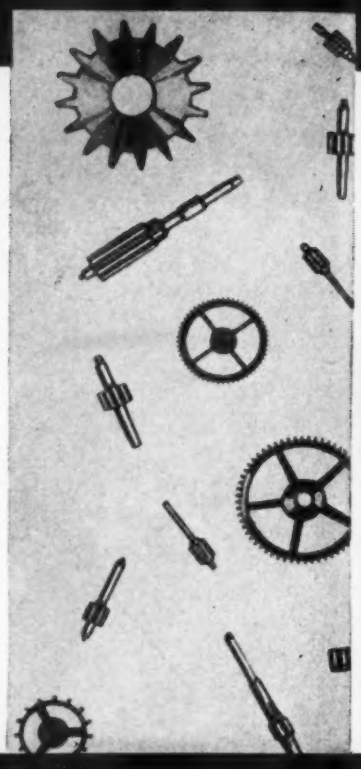


Highly productive—fast and accurate

These machines—made in single-cut, multiple-cut and magazine-feed types—are designed for the fast, precision production of gears and pinions for watches, instruments, fuses, etc. They are simple to operate, requiring no special skill. Magazine-feed machines are fully automatic, the other machines requiring positioning of blank and starting by hand.

Drive for these machines is either from countershaft or by individual motor. On motor driven machines, V-belts drive cutter spindle, worm shaft and pump.

Illustrated literature and detailed specifications are available promptly on request.



SPECIFICATIONS

PINION MACHINES

Diameter capacity, approx. ½"
Coarsest pitch about 32 D.P.
Strokes of Work slide for pinions—.24" to .45"
Strokes of work slide for stacked gears —.85 to 1"

GEAR MACHINES

Pitch diameter, capacity 1½"
Strokes for work slide, .40", .65", 1.00", 1.25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

These small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
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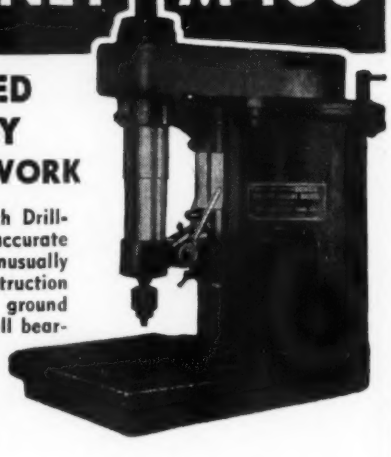
SIGOURNEY M-100



MAINTAINED ACCURACY IN PRECISION WORK

The Sigourney M-100 Bench Drilling Machine is extremely accurate on precision jobs. It is unusually sturdy and rigid in construction . . . has hardened and ground spindles . . . and sealed ball bearings throughout. All moving parts are entirely closed for maximum operator safety. M-100 is built for long and steady service.

This sturdily constructed bench drilling machine is available in 1, 2, 3 and 4 spindle models . . . speeds from 4,000 to 10,000 r.p.m.

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THE SIGOURNEY TOOL CO.
Hartford 6, Conn.

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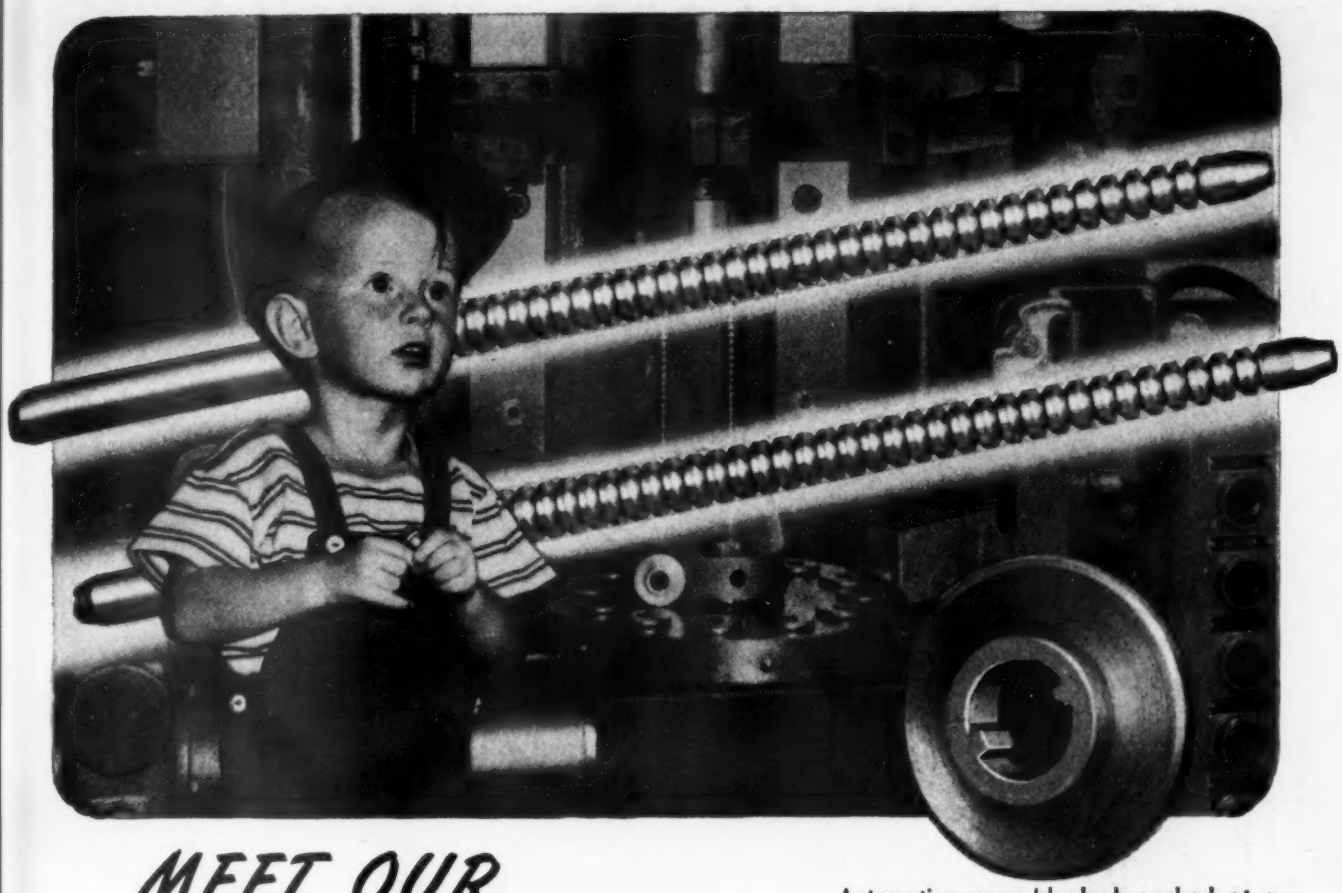


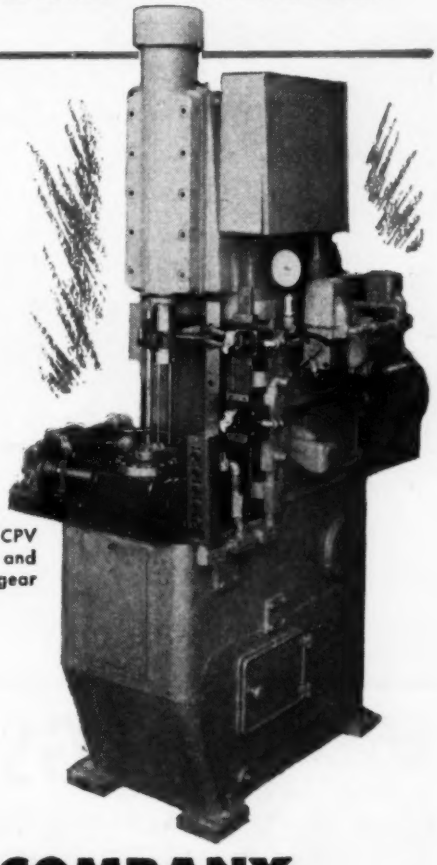
MEET OUR MR. QUINN!

Automotive gear blank, broached at a rate of 1440 pieces per hour . . . with a stock removal of .100" on the inside diameter.

He doesn't look like a highly paid, skilled machinist . . . and he isn't! Even so, he — or any other unskilled operator — can broach these gear blanks at the astounding rate of 1440 pieces per hour. This machine is fully automatic, the operator merely loads and unloads blanks on the index head. It's as simple as A-B-C . . . and twice as fast!

Two internal 2-spline strip broaches of special design, overcome an inherent tendency to drift, and are equipped with a series of burnishing buttons near the rear blank to swedge the broached opening. This provides for easy retraction of the broaches and results in an improved finish.

How about you? Lapointe designed broaching equipment may well eliminate costly and complex machining operations in *your* plant . . . provide you with that all-important low cost "plus factor" with which to meet and beat all competition. Ask Lapointe to survey your product and your plant — to prove to you that broaching, the Lapointe way, is Quicker, Cheaper . . . and BETTER!



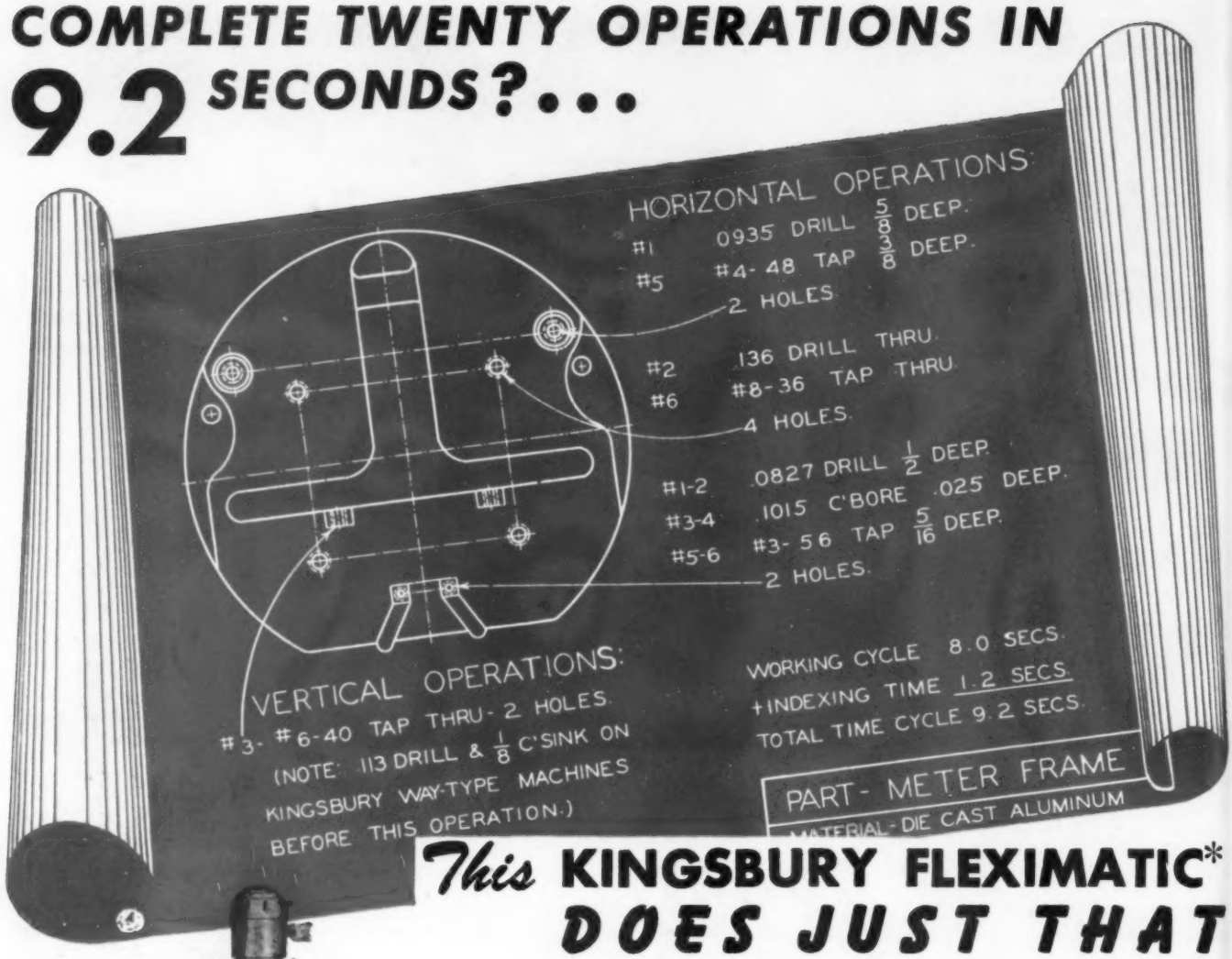
Lapointe standard 6 ton 18" stroke CPV press, with automatically synchronized cam and index head. Capable of broaching 11,520 gear blanks per eight hour day.

THE Lapointe MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

COMPLETE TWENTY OPERATIONS IN 9.2 SECONDS?...


HORIZONTAL OPERATIONS:
#1 0935 DRILL 5/8 DEEP.
#5 #4-48 TAP 5/8 DEEP.
2 HOLES.
#2 .136 DRILL THRU.
#6 #8-36 TAP THRU.
4 HOLES.
#1-2 .0827 DRILL 1/2 DEEP.
#3-4 .1015 C'BORE .025 DEEP.
#5-6 #3-56 TAP 5/16 DEEP.
2 HOLES.
VERTICAL OPERATIONS:
#3-#6-40 TAP THRU-2 HOLES.
(NOTE: 113 DRILL & 1/8 C'SINK ON KINGSBURY WAY-TYPE MACHINES BEFORE THIS OPERATION.)
WORKING CYCLE 8.0 SECS.
+INDEXING TIME 1.2 SECS.
TOTAL TIME CYCLE 9.2 SECS.
PART-METER FRAME
MATERIAL-DIE CAST ALUMINUM

This KINGSBURY FLEXIMATIC* *DOES JUST THAT*

In one chucking this Kingsbury Fleximatic automatically drills, taps, and counterbores a meter frame as shown in the sketch. Each part is chucked in one of seven identical work holders on the indexing turret. As soon as the turret has indexed and locked, the seven automatic head units start their work cycle. While they are operating on six parts, the operator removes the completed piece from the seventh work holder and replaces it with a new part. Thus, the time to complete each piece is the time for the longest single operation plus the brief indexing interval.

Because the base, the indexing turret, and the head units are all standard Kingsbury equipment, the initial cost is far lower than the usual special purpose machine. This unit construction also simplifies the problem of adapting a Fleximatic to a change in design of the part.

Kingsbury Fleximatics have reduced the machining cost of hundreds of different parts requiring multiple operations up to an inch or more in diameter. Send us samples and prints of your high production jobs specifying the operations and production desired and also the locating point. We shall make proposals without obligation.

KINGSBURY
MACHINE TOOL CORP.
KEENE, NEW HAMPSHIRE

Write for Bulletin F

* **KINGSBURY FLEXIMATIC**

—a special purpose machine for combined automatic operations during a single chucking —the result of Kingsbury engineering ability in the use of low cost *standard* Kingsbury drilling and tapping heads on *standard* Kingsbury bases.

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HEAVY STOCK REMOVAL

To settle all doubt—

MICROHONING CUTS CHIPS! MICROHONING IS METAL CUTTING!

These Are Microhoned Honing Chips—

Millions—Billions—of such small scale chips are cut by the many thousands of face contacting grits in an average 3 to 6 stone set of honing stones—all cutting at the same time. Combined—they can remove a lot of metal—up to .080″ on diameter—in a relatively short time—or at rate of .006″ to .008″ per minute.

This means that high production now has a new method of short-cutting time cost by honing from the green bore—hardening—and finish honing—with elimination of intermediate bore machining operations.

It is economical in other ways. New additive treatments in Micromatic Honing Stones yield from 200% to 400% more bores per set of stones than was formerly possible.

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How many Wars have your lathes fought?

Wars demand the utmost from machines, yet if yours is the average shop or plant, many of your lathes are "veterans" of two or more wracking periods of speed-up round-the-clock war production. On any logical basis, these tools are ready for replacement, for in battles, whether national or commercial, success goes to the one with the latest and most efficient equipment.

In turning out small parts, for example, a modern S-56 SHELDON Precision Lathe will produce them easier, faster, more economically and with greater accuracy than any "battle scarred" 1898 or 1918 tool. These 11¼" swing, 1" collet capacity, 56" bed, lathes complete with 4-speed V-belt motor drive, mounted on a modern, 5-drawer steel bench are so moderate in price, that you can have several for the cost of one large tool room lathe.

SHELDON S-56
10" Precision Lathe—11¼"
Swing, 1" Collet Capacity.
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SHELDON MACHINE CO. Inc.
Manufacturers of Sheldon Precision Lathes • Arbor Presses • Vises
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New! **REED** *Cylindrical-Die* **THREAD ROLLER**
MODEL A22

The ROLLED THREAD DIE CO. announces the new Model A22 REED Cylindrical-Die THREAD ROLLER . . . worthy successor to the Model 21 which has for several years demonstrated the advantages of *Reed-pioneered triple-die rolling.*

The unusual range and flexibility of the A-22 provide for low production and inspection costs on a large variety of hollow parts, short threads on top-heavy parts, tapered threads, threads close to shoulders, and other difficult parts made of materials ranging from soft non-ferrous metals to semi-hard alloy steels.

Write for Bulletin A22-1 which contains complete specifications.

For **PRECISION**
Threading - Knurling - Forming - Burnishing - Serrating

ROLLED THREAD DIE CO.
Thread Rolling Dies and Machines
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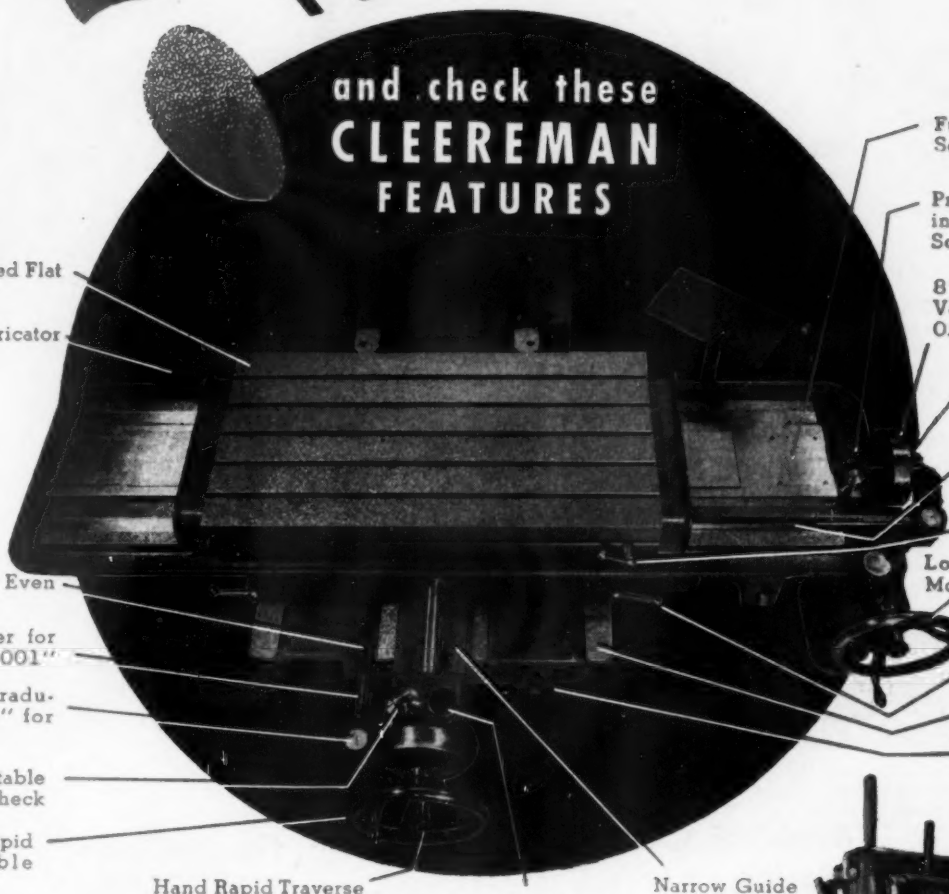
STEP UP TO THE TABLE

and check these CLEEREMAN FEATURES


Fully Protected Lead Screw
Preloaded Ball Bearings. No End Play in Screws
8" Diameter Dials and Verniers Reading to 0.0001"
Dial Locking Nut
Convenient Location of Longitudinal End Measure Trough
Table Binder Lever
Longitudinal Table Movement Controls on Front of Machine
Carriage Binder Lever
Broad Flat Ways
Start-Stop-Reverse Switch. Stop Position Sets Spindle Brake, Depressing Lever Releases Brake
Accurately Scraped Flat Table Surface
"One-Shot" Lubricator
End Measures for Even Inches
Inside Micrometer for Measuring to 0.0001"
Dial Indicator Graduated to 0.0001" for Positive Check
Graduated Adjustable Dial for Quick Check
Handwheel for Rapid Traverse of Table
Hand Rapid Traverse and Fine Feed Selector Knob
Fine Feed Handwheel for Precise Positioning of Table
Narrow Guide for Carriage of Extreme Length

The CLEEREMAN JIG BORER

for Extremely Accurate Work at Low Cost

For precision locating and boring holes in jigs, fixtures, dies and gauges no other machine or method can surpass the speed and accuracy of the Cleereman Jig Borer. Unexcelled for tool room work, the adaptability of the Cleereman Jig Borer makes it ideal for manufacturing departments in performing small lot production work without previous layout, jigs, fixtures or special tooling. The Cleereman Features described above are only a few that make this Jig Borer outstanding. The many others are fully described in Cleereman's Jig Borer Catalog No. 300. Write for a copy today!

Cleereman Machine Tool Co. of Green Bay, Wisconsin, organized in 1908 and affiliated with Bryant Machinery & Engineering Company, manufactures fine machine tools including Cleereman Precision Jig Borers and Cleereman Drilling Machines.

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Company

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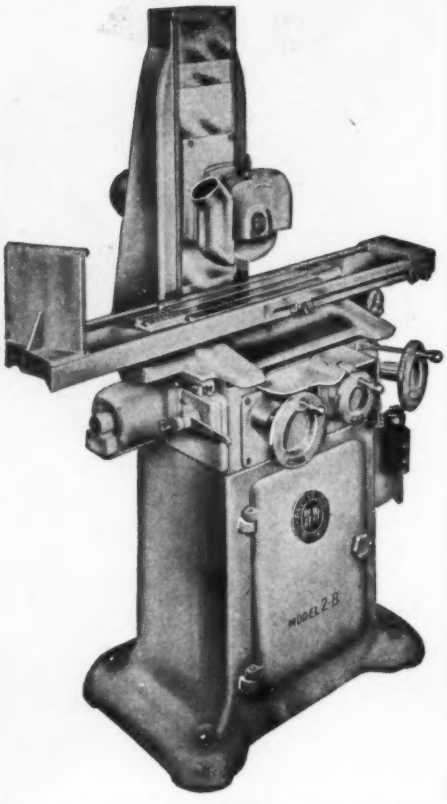
PRECISION REID SURFACE GRINDERS

CONTROLS

"At Your Fingertips"



If you are debating whether to buy a Surface Grinder let us help you to decide.

These are a few points on the *REID.*

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- CENTRALIZED FINGERTIP CONTROL (All Controls at the Apron)
- ALL WAYS ARE HAND SCRAPED (Super Accurate Alignment)
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ILLUSTRATED IS THE REID MODEL 2-B ALL-ELECTRIC POWER-FEED

The Reid model 2-C hand-feed also is an exceptionally fine machine for tool, gage, die and certain production grinding.

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No. 3 Littell Reel. Capacity, 500 lbs.

Reel-Off Coil Stock Faster at Less Cost with LITTELL REELS

COIL feeding with LITTELL Automatic Centering Reels increases production, lessens waste, improves quality, loads easier. Littell Reels are made in plain or motor-driven types for handling coils 100 to 20,000 lbs. Littell also makes Roll Feeds, Straighteners, Safety Feeders, etc.

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FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

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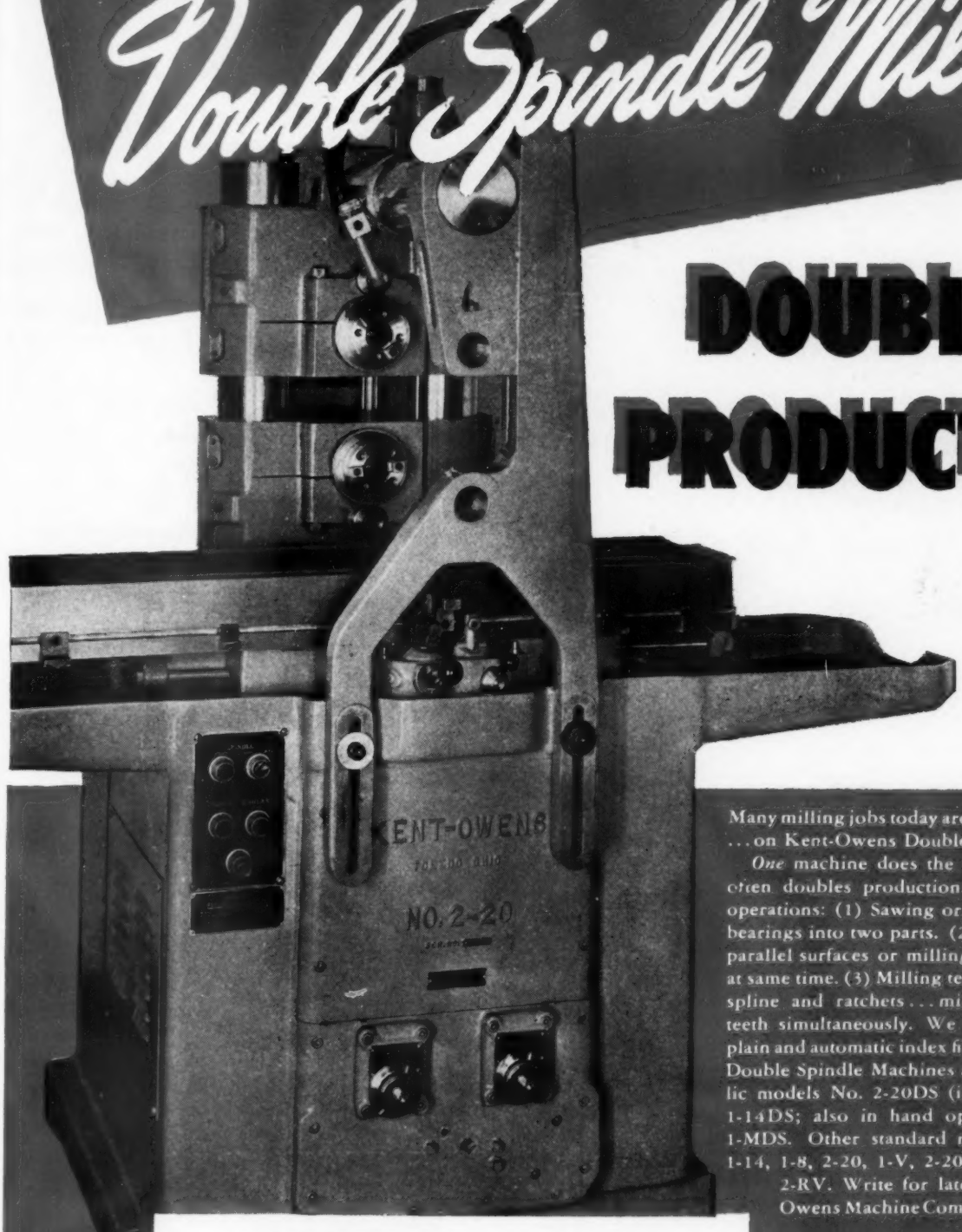
MACHINE TOOL COMPANY

CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

ANOTHER KENT-OWENS STANDARD MACHINE

Double Spindle Miller



DOUBLES PRODUCTION

Many milling jobs today are handled *doubly fast* . . . on Kent-Owens Double Spindle Machines! *One* machine does the work of *two* — and often doubles production — on these typical operations: (1) Sawing or splitting full circle bearings into two parts. (2) Face milling two parallel surfaces or milling two parallel slots at same time. (3) Milling teeth in gears, cutters, spline and ratchets . . . milling two opposite teeth simultaneously. We design and furnish plain and automatic index fixtures for this work. Double Spindle Machines available in hydraulic models No. 2-20DS (illustrated) and No. 1-14DS; also in hand operated model No. 1-MDS. Other standard models include the 1-14, 1-8, 2-20, 1-V, 2-20V, 1-14V, 1-M and 2-RV. Write for latest bulletins. Kent-Owens Machine Company, Toledo, Ohio.

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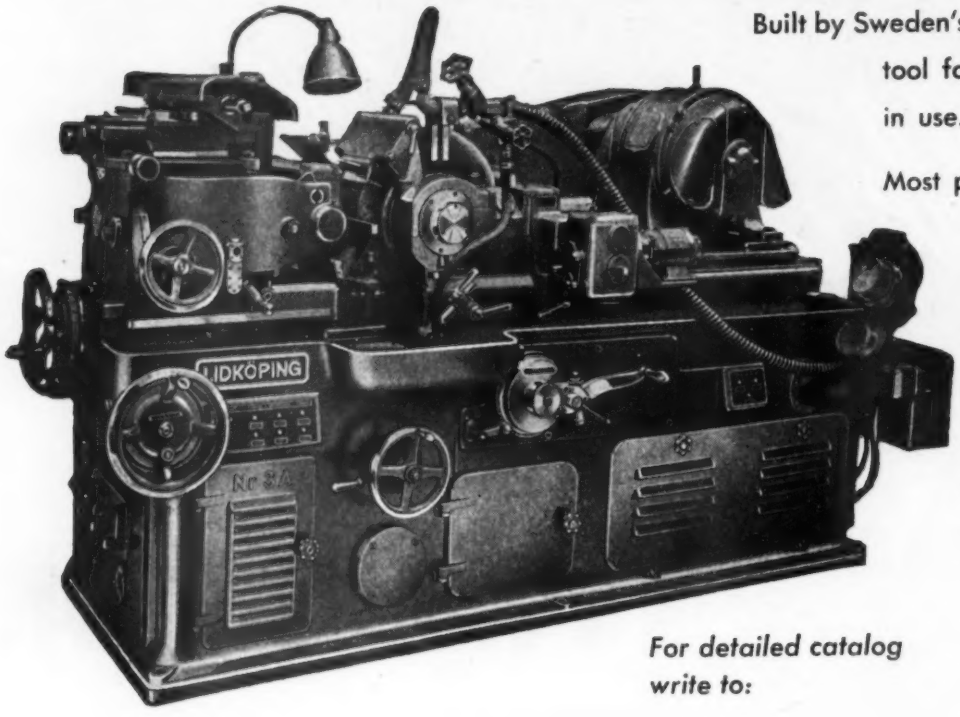
Specify

KENT-OWENS

Milling Machines

SWEDISH LIDKÖPING CENTERLESS GRINDERS



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Many sizes available for grinding pieces up to 14" diameter, 23" long; for grinding bars up to 6" diameter and 25 ft. long.

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Shoulder Grinding

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Specify Hamilton "Maxi-Jr.-E" Super Sensitive

DRILLING MACHINES

A "small hole" **production** drill supplying sensitive accuracy far beyond the usual requirements. Built for the finest precision work. (Drilling capacity .004" to 5/16" in all drillable material.) Built for intense production usage. "Takes" abuse . . . and maintains accuracy. Write for literature and prices. Address Department D-J.

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KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

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48 HOLES DRILLED ACCURATELY and SIMULTANEOUSLY

BARNESDRIL HYDRAULIC *UNIT* TYPE DRILLING MACHINE PERFORMS FASTER AND MORE EFFICIENTLY

This workpiece requires the simultaneous drilling of 32–.257" diameter holes and 16–.1495" diameter holes on the front; in addition, 31–$^{13}/_{32}$" diameter flange holes are drilled simultaneously when the workpiece is turned over. A BARNESDRIL No. 15 Hydraulic Production UNIT Type Drilling Machine, equipped with a 48-spindle auxiliary head, reduces both machining and handling time on this "special" job, with resultant lower production costs.

Designed for high production, low cost and accurate drilling, the BARNESDRIL No. 15 Hydraulic Production UNIT Type Drilling Machine has an operating cycle of rapid approach, feed, and quick return. A special in-and-out hydraulically operated table, with electric interlock, and a plate type fixture, with chip chute holds the workpiece, and speeds drilling.

Front and rear view of workpiece showing location of holes drilled on BARNESDRIL No. 15 Hydraulic UNIT Type Drilling Machine.

HIGHER PRODUCTION . . . LOWER COSTS . . . UNLIMITED FLEXIBILITY . . . ON SPECIAL MACHINING OPERATIONS

Here is a typical example of how standard BARNESDRIL Hydraulic Production UNITS and special heads and fixtures are combined to increase production on machining operations.

Drilling, reaming, facing, boring and /or tapping operations can be combined in one BARNESDRIL Hydraulic Production UNIT to provide extremely versatile, fast and low cost, high production machining. BARNESDRIL Hydraulic Production UNIT flexibility enables you to secure "special" machines for specific production jobs . . . at greater economy. Their future use is unlimited since they can be economically converted to other production set-ups.

Maximum production at lower costs is always possible with standard BARNESDRIL Hydraulic Production UNITS. Our engineering staff will assist you on your special drilling, reaming, facing, boring and /or tapping jobs, without obligation or cost for this service.

IF YOU DO NOT HAVE THE NEW BULLETIN No. 150-A, write TODAY for your FREE copy. BARNESDRIL Hydraulic Production UNITS are described together with many "special" metal working jobs these versatile machines perform.

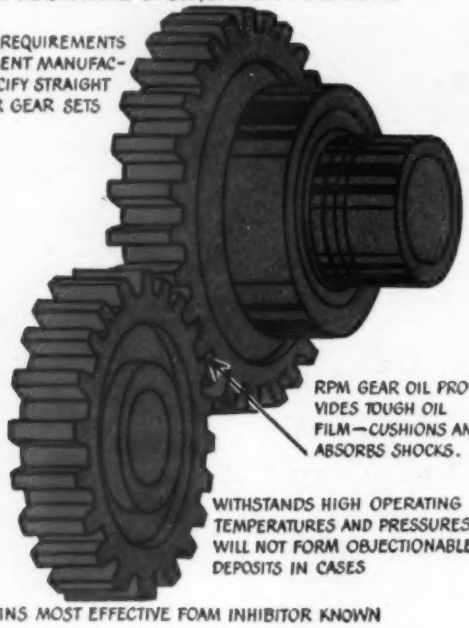
Barnes Drill Co. 830 CHESTNUT ST. ROCKFORD ILLINOIS, U. S. A.

STANDARD ENGINEERS NOTEBOOK

CALOL RPM

RPM GEAR OIL IS A HIGHLY STABLE, STRAIGHT MINERAL OIL.

MEETS GENERAL REQUIREMENTS OF GEAR EQUIPMENT MANUFACTURERS WHO SPECIFY STRAIGHT MINERAL OIL FOR GEAR SETS



RPM GEAR OIL PROVIDES TOUGH OIL FILM—CUSHIONS AND ABSORBS SHOCKS.

WITHSTANDS HIGH OPERATING TEMPERATURES AND PRESSURES—WILL NOT FORM OBJECTIONABLE DEPOSITS IN CASES

CONTAINS MOST EFFECTIVE FOAM INHIBITOR KNOWN

Straight mineral oil meets gear-maker requirements

To meet the need for a high-quality lubricant for certain transmission gears and other gear sets where a straight mineral oil is recommended, RPM Gear Oil was developed. It is made from the finest paraffinic lubricating oil stocks.

RPM Gear Oil deposits a tough lubricant film on gear teeth and bearings that prevents metal-to-metal contact in all operating conditions. It cools the surfaces and carries away heat. It extends gear and bearing life.

Because RPM Gear Oil is extremely stable, it minimizes trouble from objectionable deposits forming in cases. It eliminates foaming trouble because it contains the most effective foam inhibitor known.

RPM Gear Oil is made in three viscosity grades: SAE 90, 140, and 250. One of these grades will flow freely over gears and their bearings in every atmospheric temperature condition.

Water-white solvent speeds metal cleaning

The expense of cleaning tools, parts and other metal is reduced for many operators by the use of Standard Thinner No. 325. It has a faster final dry rate than most solvents used for this purpose, yet presents less fire hazard because its flash point is over 100°F.

Standard Thinner No. 325 does not lose any of its superior cleaning qualities in use. Contaminants readily settle out and allow removal of the clean solvent. In manufacturing plants, it is especially suitable for cleaning precision parts where slow evaporation would retard production.

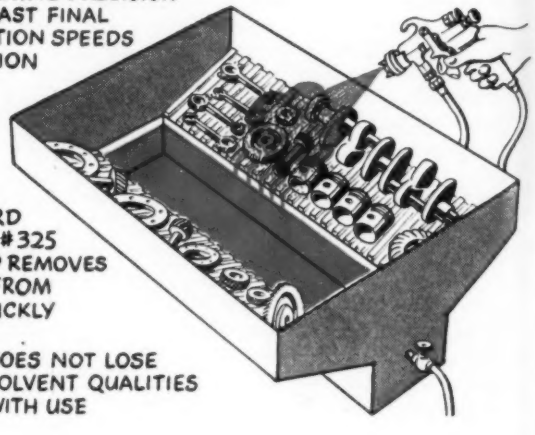
A clear, water-white product, Standard Thinner No. 325 is straight run and does not contain compounds of any kind. It is made to rigid specifications from the heart-cut of selected crude stocks. This assures constant uniformity.

No. 325 is only one of a complete line of petroleum solvents made by Standard of California.

HAS FLASH POINT OVER 100° F., BUT DRIES RELATIVELY FAST

STANDARD THINNER #325 IS A WATER-WHITE, STRAIGHT-RUN, UNCOMPOUNDED PETROLEUM SOLVENT

ESPECIALLY SUITABLE FOR CLEANING PRECISION PARTS. FAST FINAL EVAPORATION SPEEDS PRODUCTION



STANDARD THINNER #325 CUTS AND REMOVES GREASE FROM PARTS QUICKLY

DOES NOT LOSE SOLVENT QUALITIES WITH USE

For additional information and the name of your nearest Distributor, write Standard of California, 225 Bush Street, San Francisco 20, Calif.; The California Oil Company, 30 Rockefeller Plaza, New York 20, N. Y.; The California Company, 17th and Stout Streets, Denver 1, Col.; Standard Oil Company of Texas, El Paso, Texas.

FOR EVERY NEED A **STANDARD OF CALIFORNIA** JOB-PROVED PRODUCT

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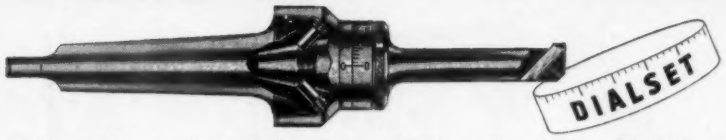


MICROMETRIC BORING TOOLS

Adjustable on the job through .0005" graduations to .025". Closer tolerances obtainable by setting between graduations. Correct adjustment for a production run can be made after one preliminary cut, saving hours of set-up time in many instances.

Cone and socket principle (illustrated in sectional view) gives the strength and rigidity of a solid bar when the three setscrews are tightened. Insert will not slip under heaviest cuts.

Made in three series. "A" Series consists of holder and four inserts with minimum cutting diameters of ⅜" to 1-1/16". "B" Series, one holder and five inserts; 1½" to 2½". "C" Series, one holder and three inserts; 3" to 4". Cutting diameters can be increased by bit extension as well as by micrometric adjustment. Regularly furnished with H.S.S. or carbide-tipped bits. Straight or taper shanks.

Bulletin N-1 gives complete descriptions and prices.

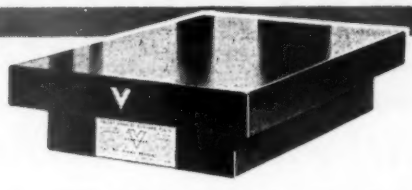
FOUR-CUTTER BORING and REAMING BARS

Plain or fluted bodies. Opposing bits provide balanced thrust, preventing bar spring. Smaller chips do not clog. FOUR-CUTTERS are unequalled for core drilling and heavy hogging, as well as for precision boring and reaming.

Each bit can be protruded separately by means of a follow screw for increasing diameter or sharpening. Adjustments vary from ⅛" to 1¼" in the twenty sizes which have minimum cutting diameters of ¾" to 4¾". Regular bits are H.S.S. or carbide tipped. Straight or taper shanks.

Special models are built to meet requirements—with duplex heads for boring two or more diameters; with wear strips, pilots, collars, facing bits, center oil holes, etc.

Bulletin gives complete descriptions and prices.



VELSEY BLACK GRANITE SURFACE PLATES

Black Granite is Commercial name of OLIVINE DIABASE—Harder and denser than Granite.

The most accurate flats in large sizes produced commercially. Black granite permits lapping to .00005" surface flatness. Freeze-proof, warp-proof, rustless, shock-proof, non-abrasive, non-magnetic, and enduringly flat.

Standard sizes are 12" x 18", 18" x 24", and 24" x 36". Other sizes can be furnished on special order. Metal stands with casters are available for VELSEY Surface Plates. Rigid construction. Roomy drawers for instruments.

Bulletin gives complete descriptions and prices.

Announcement of our FOUR-CUTTER Tools in 1944 and DIALSET Tools in 1945 aroused widespread interest. The hundreds of inquiries we received resulted in conferences with executives of the largest manufacturers in the country. Several improvements were developed from these interviews, making the tools even more practical than they were originally. They have the endorsement of America's leading engineers and production men. The VELSEY Surface Plate was perfected a number of years ago, and it is accepted as the ultimate in material and precision.

East Shore Machine Products Company
State Tools Division
835-7 East 140th St., Cleveland 10, Ohio

Send bulletins on: ☐ Dialset Tools. ☐ Four-Cutter Tools. ☐ Velsey Surface Plates.

Individual and Title

Company

Street Address

City State

EASE OF OPERATION!

WHY MORE and MORE PLANTS PREFER GEMCO SHAPERS

GEMCO

Multi-Purpose SHAPERS

Yes, *ease of operation* is a good reason why so many plants are enthusiastic about GEMCO Shapers. For one thing, GEMCO'S are easier to get "used to". All controls are within easy reach of the operator. For each operation or machine function, the controls are exactly where they ought to be. Thus, it's easier for the operator to get the feel and to lead the machine through a series of precision operations or to do just rough machining.

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'Don't stay awake nights over your cutting oil problems

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These and similar puzzling problems must pop up periodically in your plant. How do you answer them? By tossing them around in your mind between counting sheep at night and by hours of experimenting during the day? If so, you can stop right now. At least as soon as you have put your problems up to a Standard Oil Cutting Oil Specialist.

If your plant is located in the Midwest there is one of these cutting oil specialists at the nearest Standard Oil office ready to study your cutting oil needs. There are two sound reasons why he can help you. First, he has complete knowledge of products developed by Standard Oil for practically all machining operations. Second, he has experience in applying these products in many other plants.

You'll find Standard's Cutting Oil Service the real short cut to your cutting oil answers. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

Standard's
CUTTING OIL SERVICE

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LUBRICATION ENGINEERING...STANDARD OIL COMPANY (INDIANA)...LUBRICATION ENGINEERING...STAND

Where large gears need special protection use . . .

CALUMET
Viscous Lubricants

DUST AND GRIT, heavy loads, excessive heat or wate are some of the adverse conditions under which o dinary gear shields cannot give adequate protectio Calumet Viscous Lubricants are not the old type o gear shield, usually made from residual products o petroleum. They are true greases, manufactured fro selected soaps and oils, plus additives, to secure th quality most needed in a modern gear lubricant.

Calumet Viscous Lubricants offer these advantages

1. Give long lasting protection. An additive i Calumet Viscous Lubricants gives them improve wetting ability—that is, the ability to adhere closely t metal. This not only provides a long lasting film, un der ordinary operation, but a film that resists hea and water.

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Let this wear-reducing, time-saving lubricant pro tect open gears on all types of equipment. A Standar Oil Lubrication Engineer will survey your plant and help determine the grades you need and the most economical method of application.

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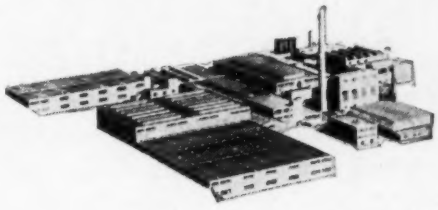
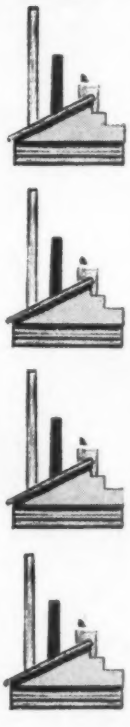
The production schedule of your metal-working plant depends on having the right tools, at the right place, at the right time. Your industrial distributor offers a single source of supply for hundreds of products, saving time, money and manpower because the . . .



METAL-WORKING PLANT

EQUIPMENT, TOOL AND SUPPLY MANUFACTURERS



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All gears are shaved and induction hardened

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Many toolmakers find the little Linley Miller and Jig Borer invaluable for performing countless small jobs on dies, jigs, fixtures, patterns and models . . . quickly and accurately.

The Linley is versatile because setup is fast and changeover easy. Direct micrometer setting eliminates errors . . . grease-sealed bearings need no adjustment and all rotating parts are carefully balanced. Eight velvet-smooth spindle speeds to 4250 r.p.m. give a speed for every need.

Investigate this compact machine that fits in 2½ sq. ft. of space and cuts costs by saving larger machines for their higher rated capacities.

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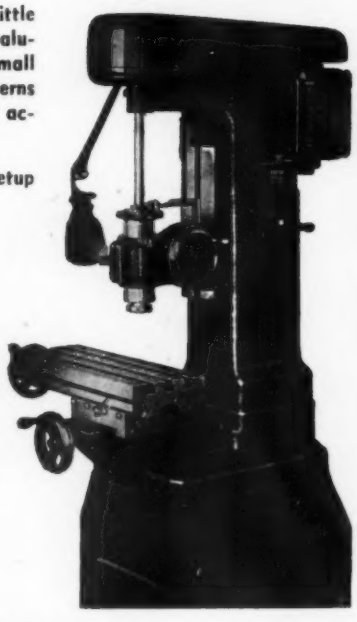

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highest returns on your investment...*because*

We guarantee that the Wade No. 8-A Toolmaker's Lathe will out-produce and out-perform any make of lathe within its size and capacity!

We back up this guarantee with such 8-A features as instant reversing—instant Hi-Lo speeds (3:1 ratio)—vibrationless operation—highest speeds—enduring accuracy—finest finish—most advanced spindle bearing design—a complete line of tools and accessories for utmost versatility. For the complete story and detailed specifications, write for catalog.

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The Wade Tool Co.

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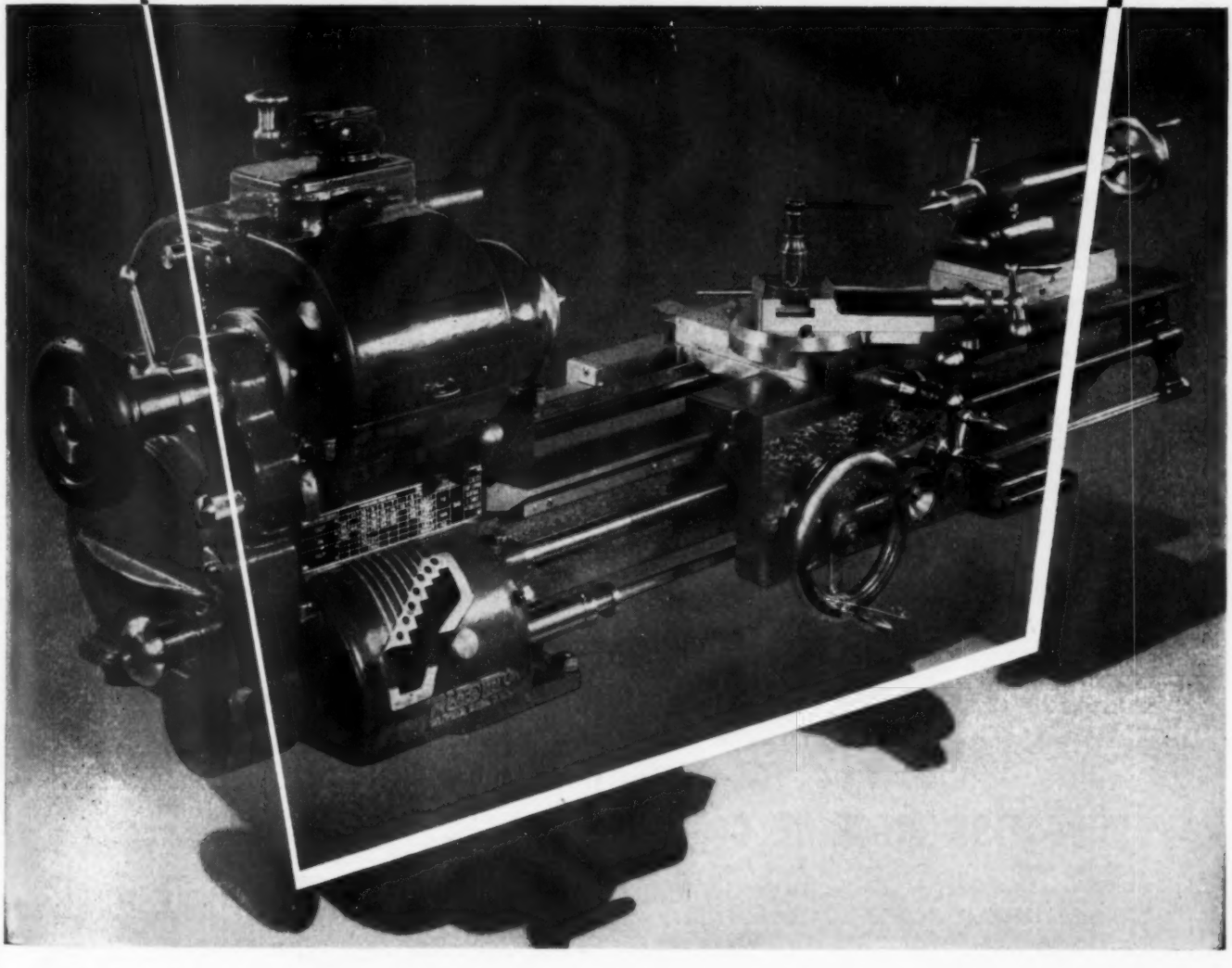
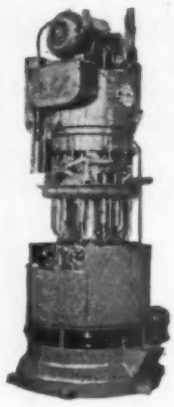
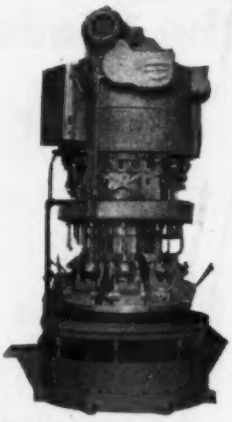
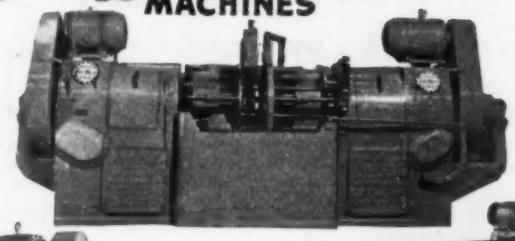


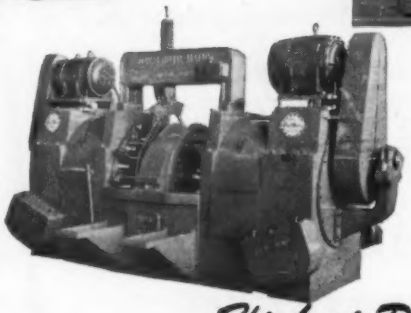


Roto-Matic Drilling MACHINES

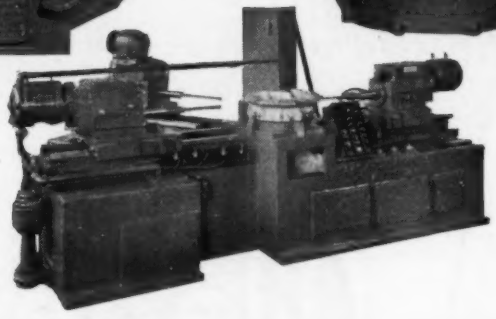
VERTICAL AND HORIZONTAL TYPES







MULTIPLE SPINDLES



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H. P.—7½ to 10.

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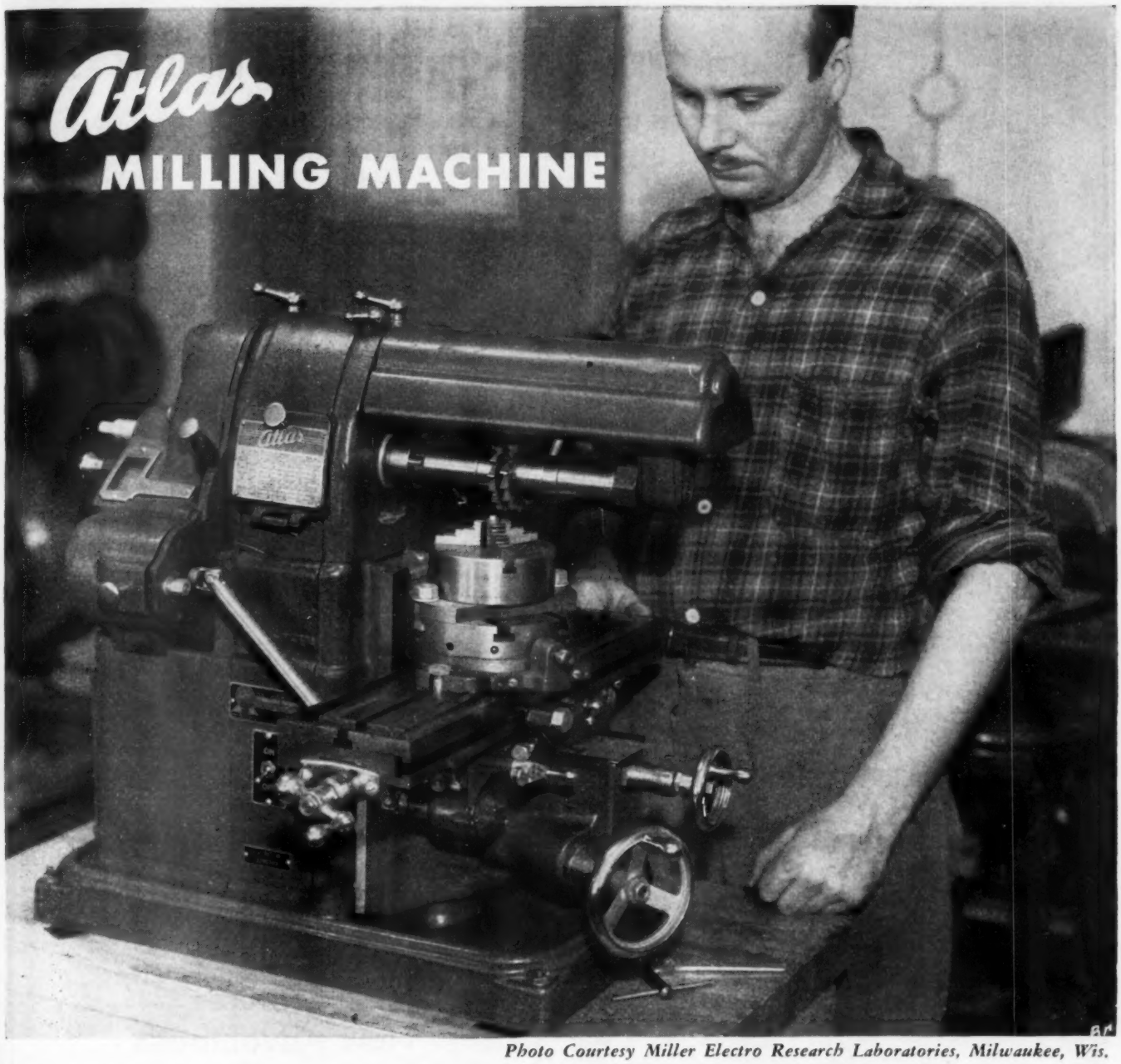

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Any part that comes within its 4½" x 18" table traveling 10" longitudinally and 3½" cross-table, can be milled to close tolerances quickly and easily. There are eight spindle speeds from 62 to 2870 RPM. Three types of table controls are available — manual, lever, or Change-O-Matic. Adding air chuck and control devices gives you a semi-automatic machine capable of suprising production records.

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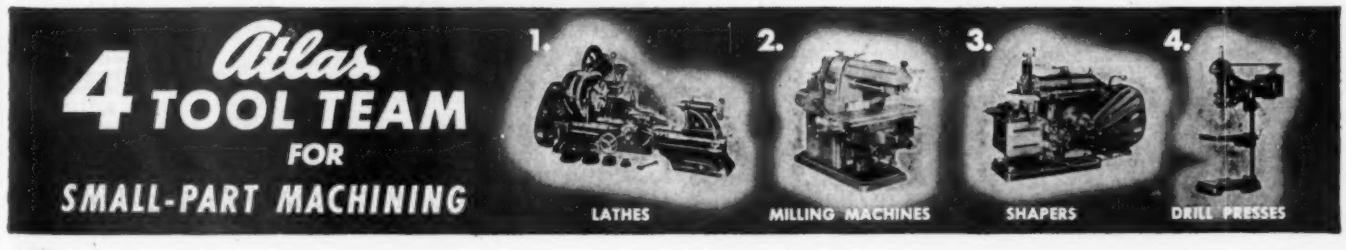

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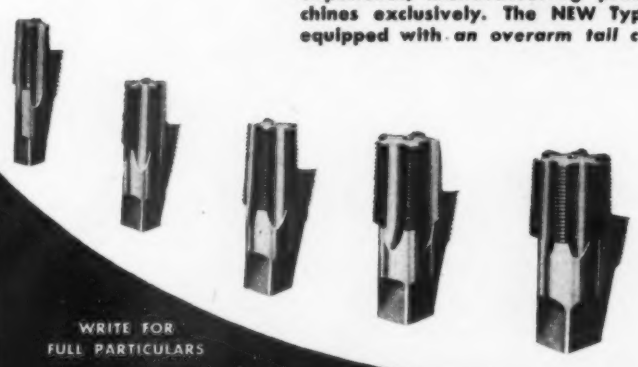

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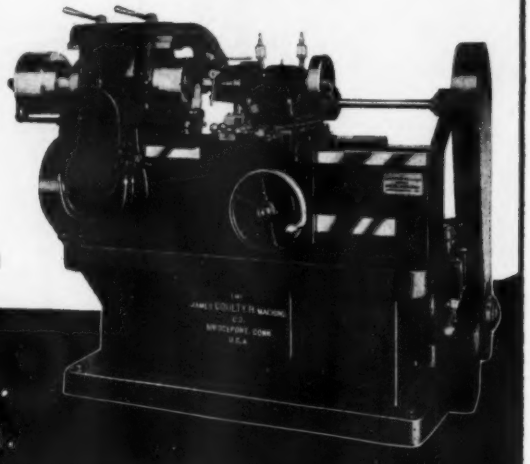

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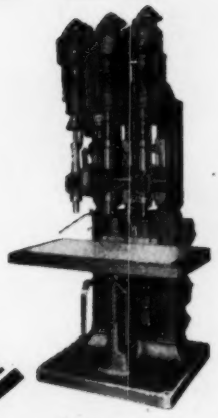

HAND FEED REVERSING MOTOR FOR TAPPING

MOTOR & GEAR BOX CONSTRUCTION OF 6 SPEED MACHINE

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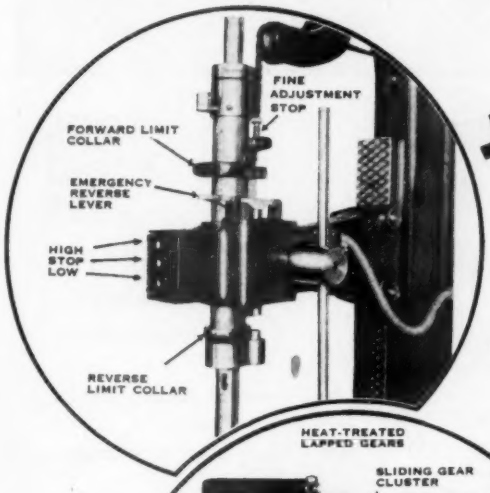
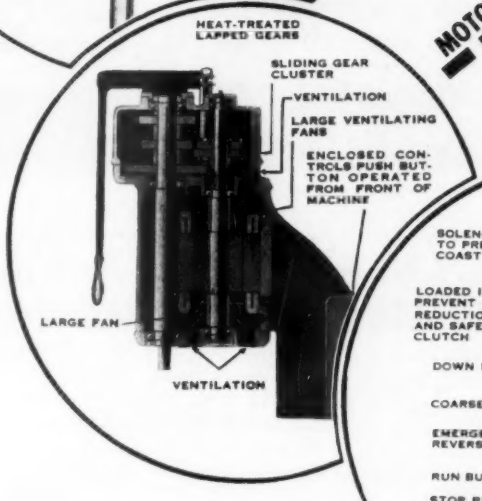
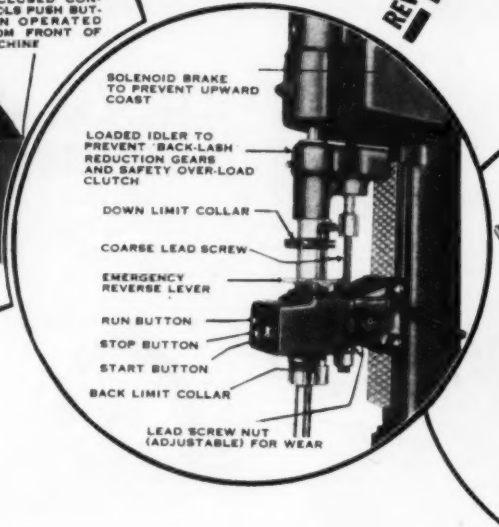
SINGLE LEVER CONTROL—AVEYMATIC POWER FEED



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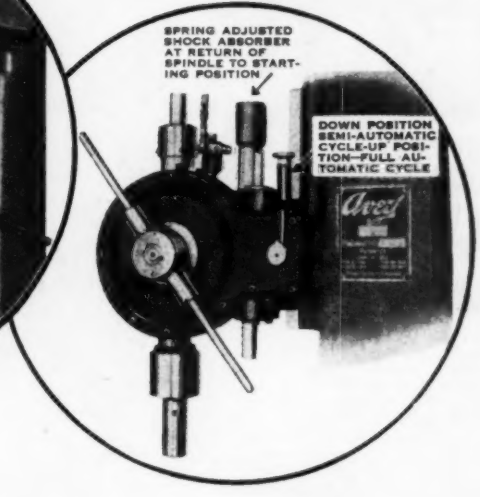
STOP BUTTON
START BUTTON
BACK LIMIT COLLAR
LEAD SCREW NUT (ADJUSTABLE) FOR WEAR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DOWN POSITION SEMI-AUTOMATIC CYCLE-UP POSITION—FULL AUTOMATIC CYCLE
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The Avey Type MA-6 is made in the following capacities

No. 2— ⅞" capacity in cast iron
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Any spindle of MA-6 can be arranged with any one of above FEATURES giving ease of operation —ideal for production set up.

Avey DRILLING MACHINES
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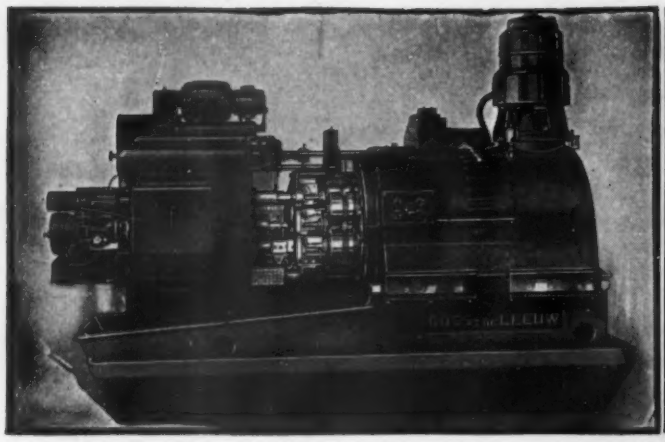

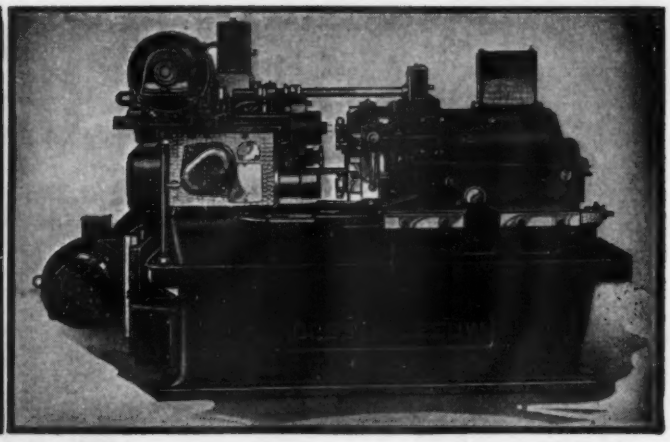

WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

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Built for Hi-Duty Precision Service

Kaufman No. 10A Hi-Duty single spindle Lead Screw Tapper, made in 3 HP and 1½ HP models, with ¾" N.C. and 1½" N.C. Threads in alloy steel, offers these features:

Fully enclosed . . . lead screw and nut operate constantly in oil bath . . . positively wear-proof clutches instantly engaged and controlled by air cylinder . . . quick traverse when not actually cutting threads . . . accurate depth control . . . control to protect tap overload, and further protected against jamming if work is placed in upside down . . . class 3 fits always assured and perfectly controllable.

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IN LESS SPACE

Gallmeyer & Livingston's GRAND RAPIDS Combination Tap and Drill Grinder is the only machine of its type. All of the advantages of the Grand Rapids Twist Drill Grinder and the Grand Rapids Tap Grinder are combined in this one machine.

You save three ways by investing in this machine: On first cost, on lower maintenance expense and on valuable floor space.

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SPECIFICATIONS

Capacity (drill)	⅛" to 1½"
Capacity (tap)	No. 6 to 1½"
Spindle Speed	1725 R.P.M.
Dia. Grind. Wheels	10½" and 12"
Motor	1 H.P.

GRAND RAPIDS
MANUFACTURED BY
GALLMEYER & LIVINGSTON CO.
GRAND RAPIDS, MICHIGAN, U.S.A.

What "GRAND RAPIDS" Quality Means: Gallmeyer & Livingston cast their close-grained gray iron, machine to micrometric tolerances, precision-assemble grinding machinery of unsurpassed performance. *Grand Rapids* means *top* quality in grinding machinery.

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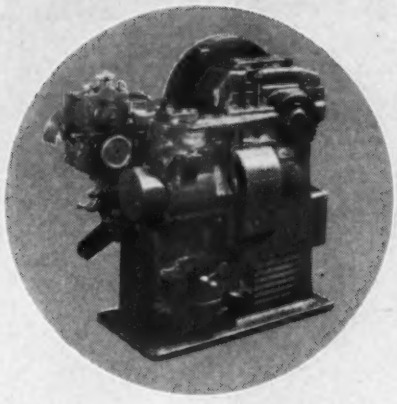

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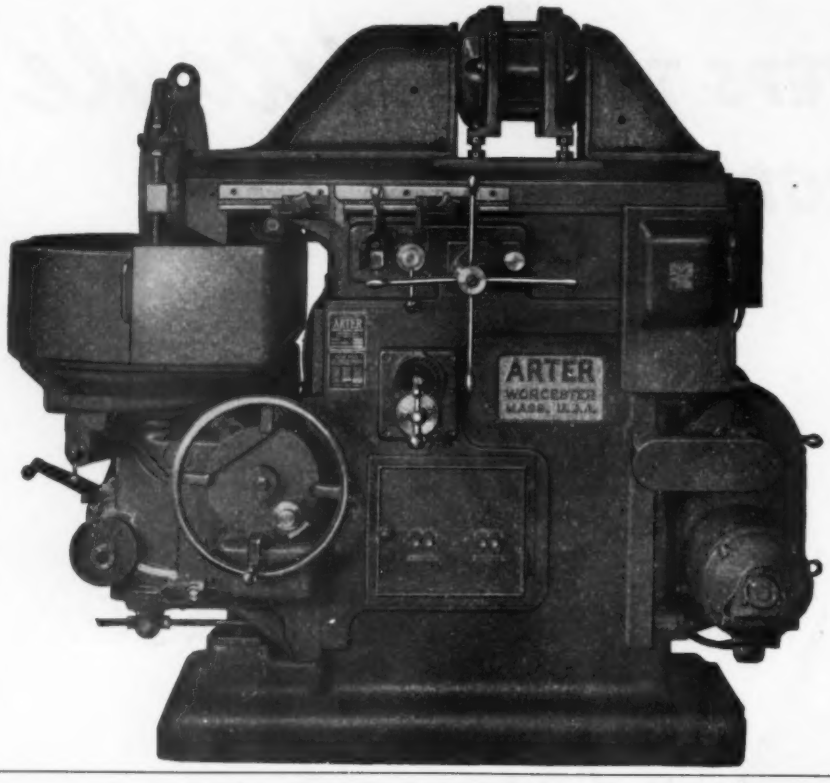

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Wheel slide hydraulically operated with piston rod and wheel spindle axis level with the longer, front extended, widened ways, gives smoothness to the traverse and stability to the spindle.

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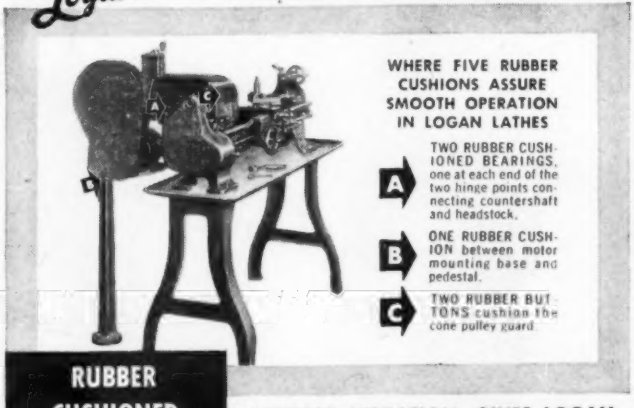
Logan A NAME TO REMEMBER WHEN YOU THINK OF BETTER LATHES


WHERE FIVE RUBBER CUSHIONS ASSURE SMOOTH OPERATION IN LOGAN LATHES
A TWO RUBBER CUSHIONED BEARINGS, one at each end of the two hinge points connecting countershaft and headstock.
B ONE RUBBER CUSHION between motor mounting base and pedestal.
C TWO RUBBER BUTTONS cushion the cone pulley guard.

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Quick-Change Gear Turret Lathe

SPECIFICATIONS COMMON TO ALL LOGAN LATHES . . . swing over bed, 10½" . . . bed length, 43⅛" . . . size of hole through spindle, 25/32" . . . spindle nose diameter and threads per inch, 1½"-8 . . . 12 spindle speeds, 30 to 1450 rpm . . . motor, ½ hp, 1750 rpm . . . ball bearing spindle mounting . . . drum type reversing motor switch and cord . . . precision ground ways, 2 V-ways, 2 flat ways.

K-4

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L-W 4-JAW INDEPENDENT LATHE CHUCKS

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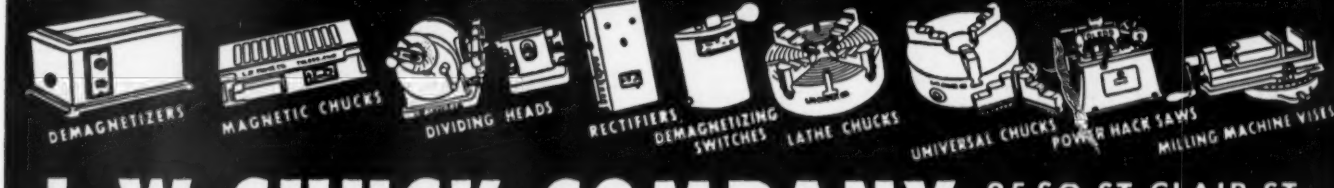
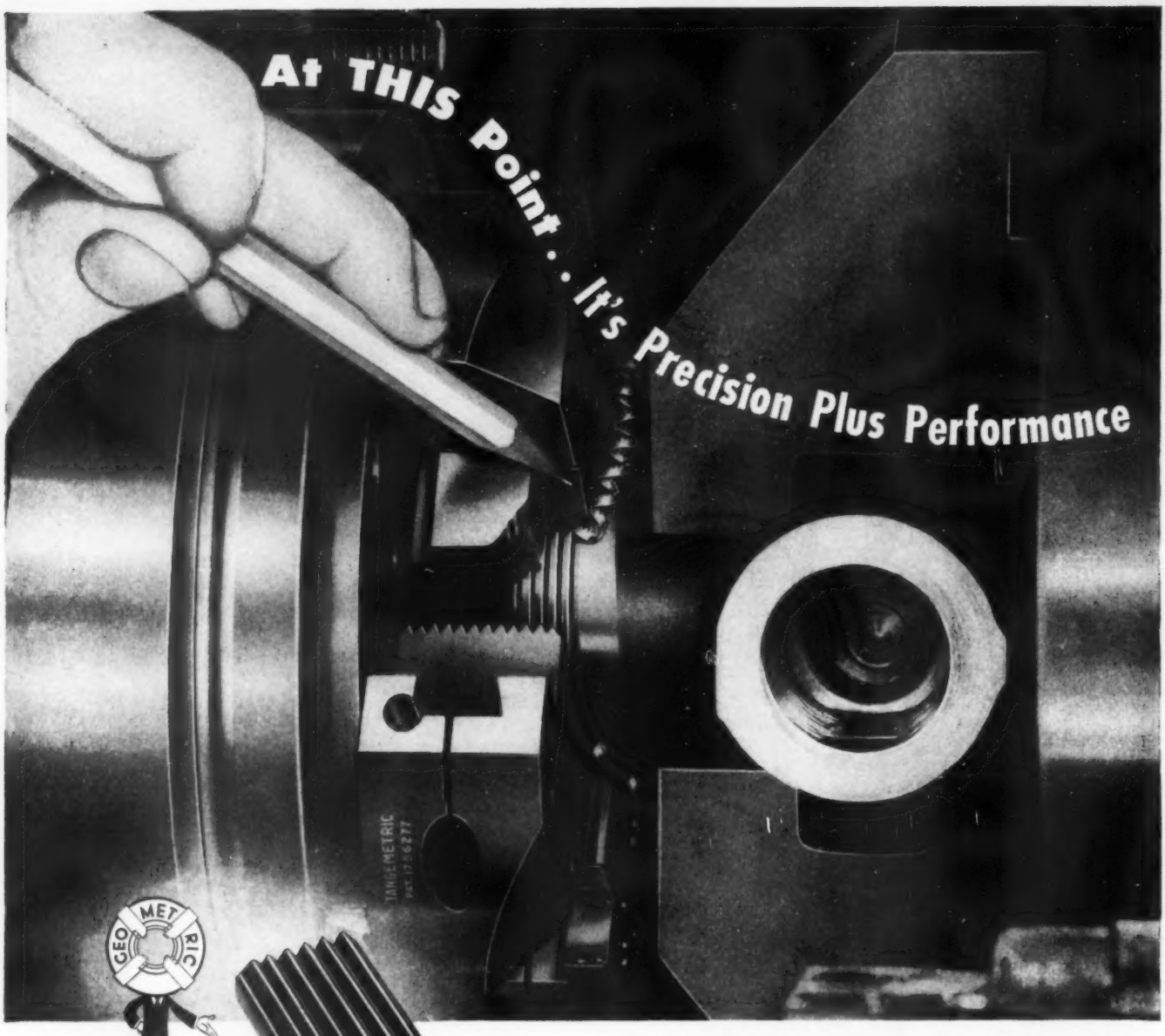
L-W THREE-JAW UNIVERSAL LATHE AND SCREW MACHINE CHUCKS for light or heavy duty work. Guaranteed to run true. Accurately fitted, hardened and ground male and female reversible jaws. Rugged semi-steel cast body. Accurately cut high grade steel geared scroll and pinions. 6 1/4" sizes ($45.00), 7 1/2" sizes ($55.00), and 10 1/2" sizes ($83.35).

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products



L-W CHUCK COMPANY 25 SO. ST. CLAIR ST. TOLEDO 4, OHIO



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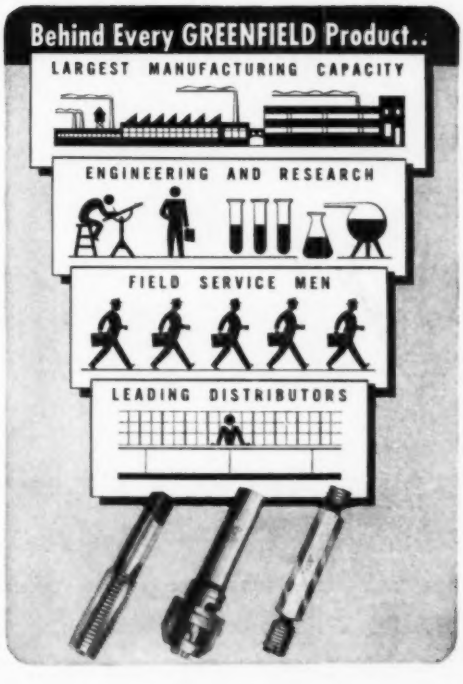

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GREENFIELD TAP and DIE CORPORATION

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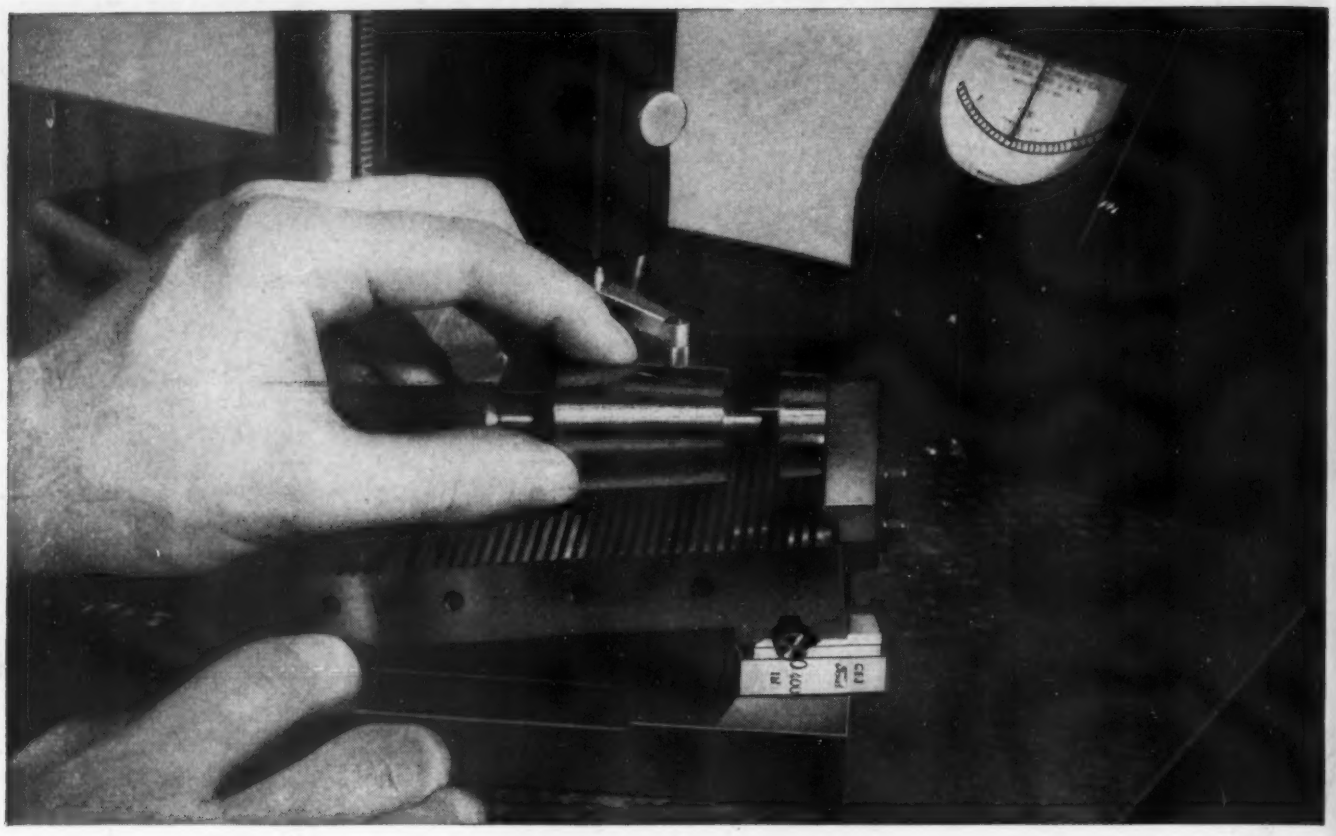

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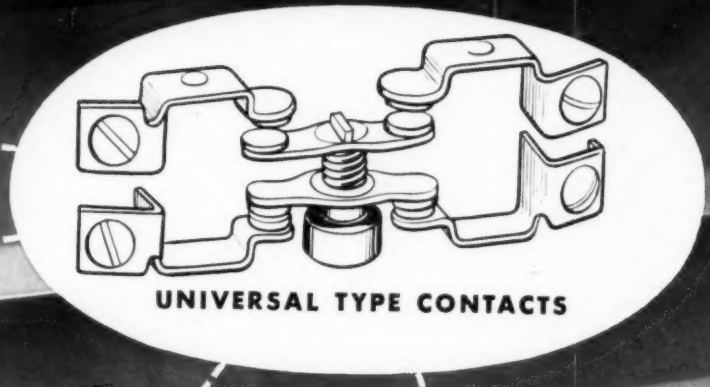
Here are 4 Relays that Equal 18

. . . they will satisfy any industrial requirement



UNIVERSAL TYPE CONTACTS

TWO-POLE UNIVERSAL RELAY

FOUR-POLE UNIVERSAL RELAY

SIX-POLE UNIVERSAL RELAY

EIGHT-POLE UNIVERSAL RELAY

You can provide for unexpected design or circuit changes with the new Bulletin 700 Universal Solenoid Relays. These relays are a new idea in relay design—an amazingly simple one. To change from "normally open" to "normally closed" contacts—or vice versa—you merely change the contact connections. A most convenient arrangement for experimental work or tricky control circuits. These relays have the same time-proven construction as all other Bulletin 700 Solenoid Relays. Available in 2, 4, 6, and 8-pole construction. Also furnished as a Bulletin 200 direct current "Universal" relay. Write for information.

A-B Quality

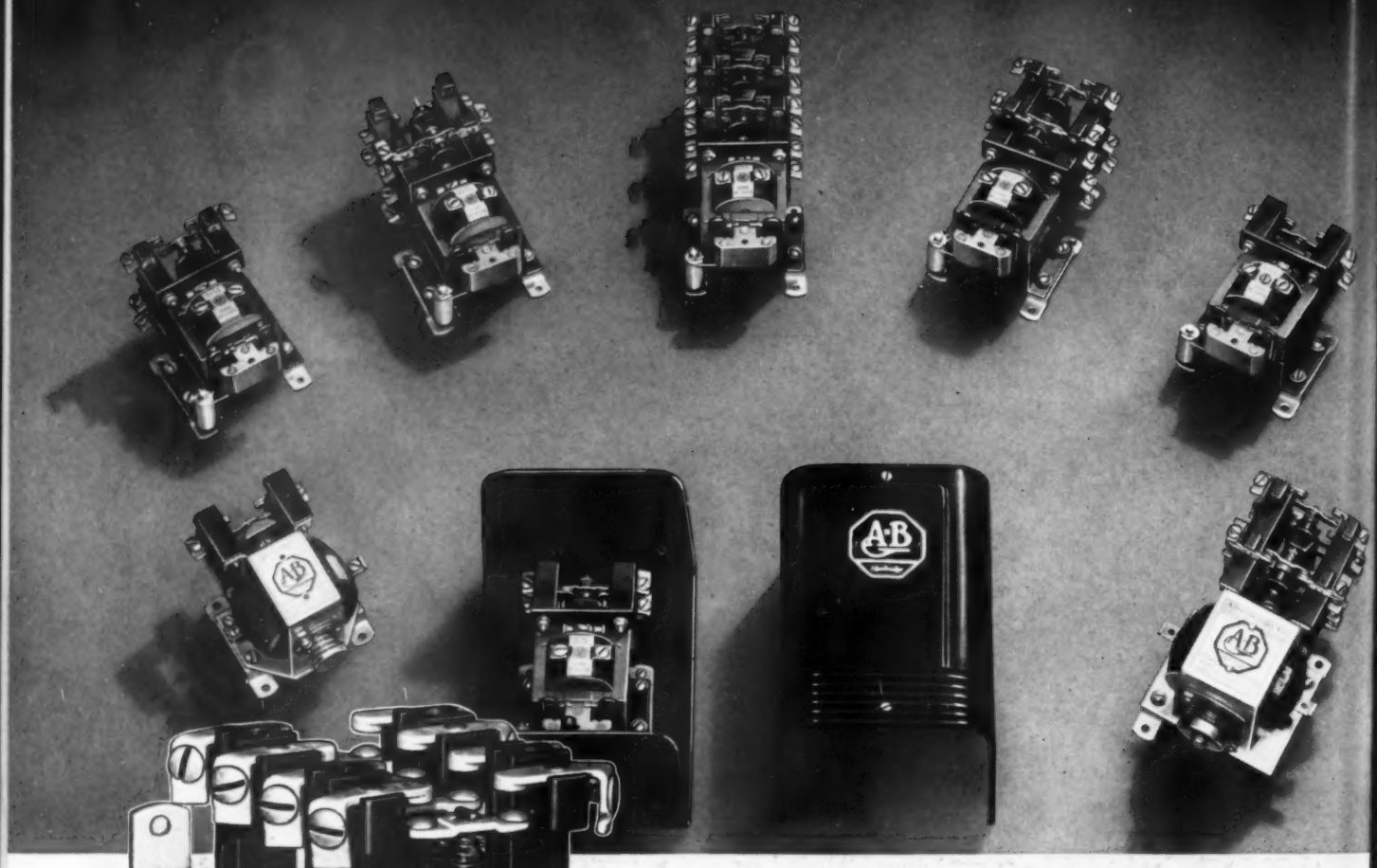
BULLETIN 700 (A. C.)
BULLETIN 200 (D. C.)

ALLEN-BRADLEY

UNIVERSAL SOLENOID RELAYS

QUALITY

Good for MILLIONS of Operations



Bulletin 700 (A.C.) ★ Bulletin 200 (D.C.)

SOLENOID RELAYS

Here is a line of small, solenoid-operated relays for industrial applications that require unfailing dependability. Can be furnished in single and multiple pole construction, up to and including 12-pole units. Available in the open type, or in the NEMA Type 1, Type 4, and Type 7 enclosures.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

NO BEARINGS, PINS, PIVOTS
The only moving part is the solenoid plunger. There are no parts to gum up or corrode and cause trouble.

NO CONTACT MAINTENANCE
Double break, patented cadmium silver alloy contacts never require any cleaning, filing, or dressing.

SIMPLE, RUGGED DESIGN
Bulletin 700 relays are ruggedly built to withstand millions of operations on the heaviest industrial service.

EASY TO WIRE
All terminals are conveniently accessible and plainly marked. Enclosures provide generous space for wiring.

A-B Quality

Also . . . BULLETIN 709 Across-the-Line SOLENOID STARTERS

Now six sizes, all designed to meet every industrial service. Maximum rating: 100 hp, 220v; 200 hp, 440-550-600 v.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

QUALITY

NILES

★ Over 100 years experience building high quality into a vast quantity of machine tools.

● Niles Planer operators appreciate the simplified Duplex Control; quick acting Rail Clamps; Balanced Drive; and Safety Features in this modern design, because they permit maximum quality production on the job without exhaustive labor. Energetic, satisfied shop men mean additional profits to Niles Planer owners.

- Two Heads on Crossrail
- Two Side Heads
- Automatic Tool Lifters for Rail Heads and Side Heads
- Power Angular Feed for Side Heads
- Automatic Lubrication for Tracks, Driving Gears and Bearings
- Hand Feed for all Heads
- Power Feed for All Heads
- Power Traverse for All Heads
- Reversing Motor, Directly Connected to Drive Shaft through Flexible Coupling

Write for circulars Nos. 325-2 and 3

GENERAL MACHINERY CORPORATION

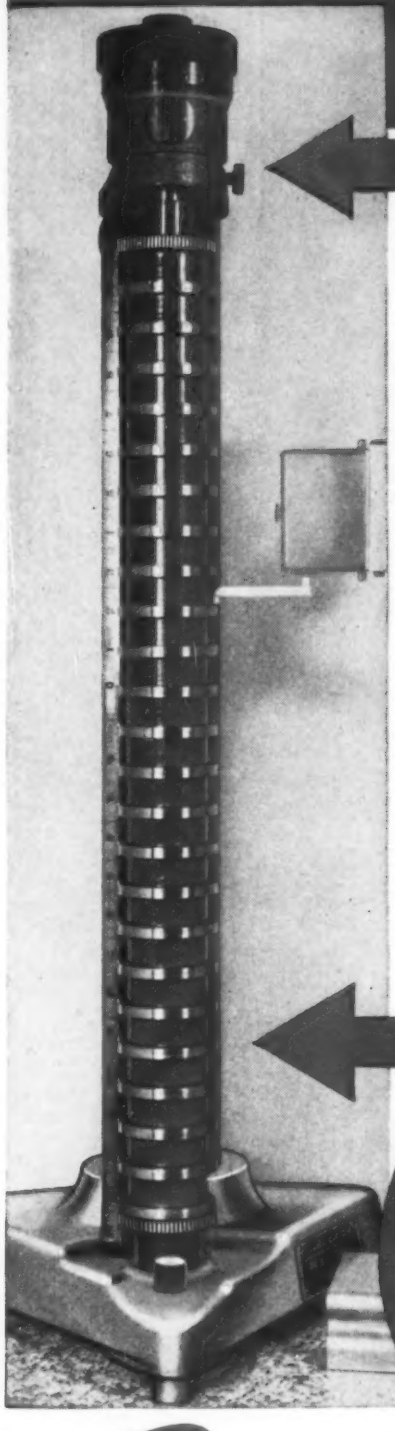
HAMILTON, OHIO

REPRESENTED THROUGHOUT LATIN AMERICA BY MACHINE AFFILIATES, INC.

THE NILES TOOL WORKS CO. ★ THE HOOVEN, OWENS, RENTSCHLER CO.

SETTING TIME: 10 SECONDS!
ACCURACY: .0001" in 24"!

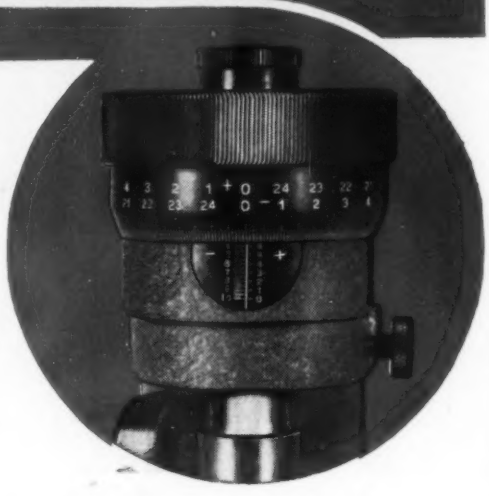
Cadillac PLA-CHEK SPEEDS CLOSE TOLERANCES DEMANDED BY POST WAR JOBS



● **Get This New 24" Model PLA-CHEK for FASTER . . . MORE ACCURATE INSPECTION.**

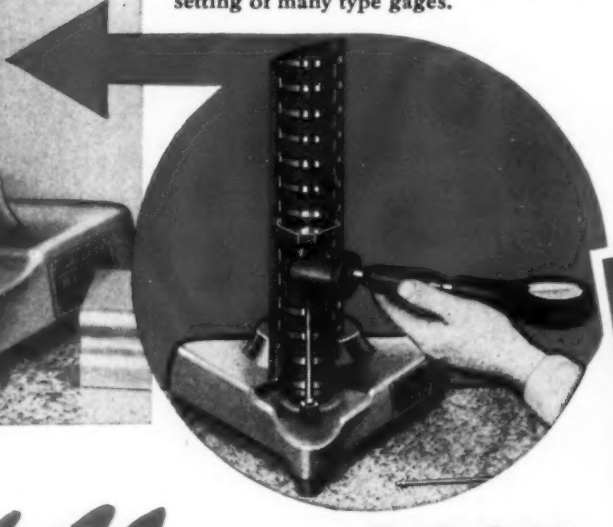
PLA-CHEK is *guaranteed* accurate to .0001" in 24". An adjustable measuring bar with an endless scale graduated from zero to 24 inches each way establishes the minute tolerances demanded today . . . quickly, easily, accurately. The micrometer thimble graduated *plus* or *minus* enables the user to check *up* and *down* from the center line of work.

A reverse checking plate may be quickly and easily clipped to any one-inch step on the Pla-Chek bar. The lower measuring flange is set even with the lapped button with the micrometer thimble set at zero. Inside micrometers, telescoping gages, or internal cylinder gages can be set directly between the button and the reverse checking plate by merely setting the micrometer thimble to desired dimension.



MICROMETER THIMBLE—Arrow indicates 1" of measuring sleeve travel in addition to 1" of micrometer travel. This enables user to measure directly from center or reference line of job.

REVERSE CHECKING PLATE—Speeds setting of many type gages.

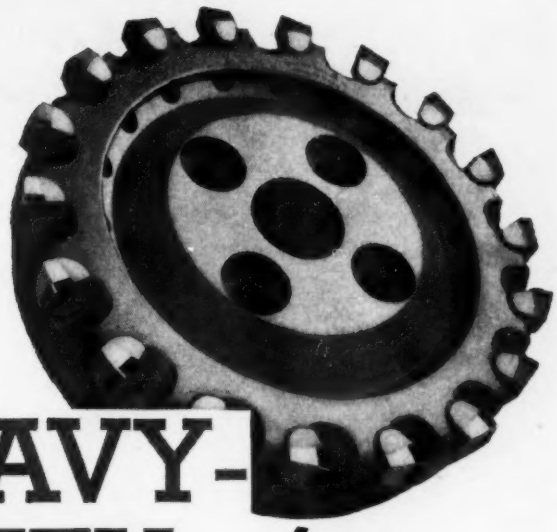


Body heat does not affect the findings of Pla-Chek. There is no contact between the inspector's hands and the measuring bar. Speed your postwar inspections with this new Pla-Chek . . . the astounding new gage for surface plate work.

TRY IT BEFORE YOU BUY IT!
See how much time PLA-CHEK will save you. We will be glad to send it on two-weeks free trial. If this trial satisfies you, send your check. If not, return PLA-CHEK express collect and you owe us nothing. Write, Wire, or Telephone. Reverse the Charges! Telephone: PRospect 1644.

Cadillac GAGE COMPANY

20316 HOOVER ROAD DETROIT 5, MICHIGAN



HEAVY-DUTY *for* CAPACITY PRODUCTION

THE TYPE "H" FACE MILLING CUTTER

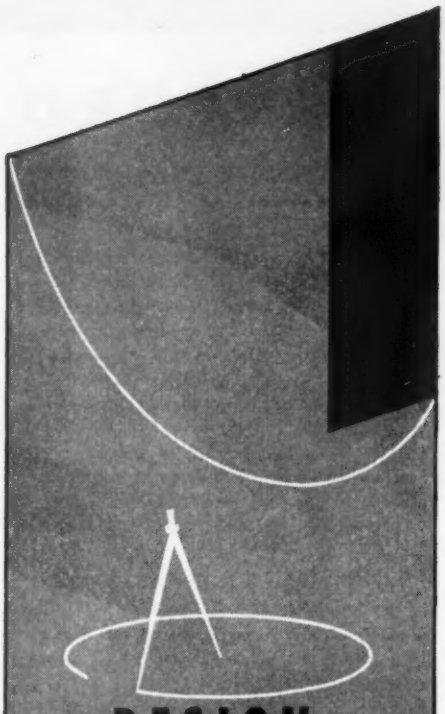
When the job is face milling—at capacity production—call on a Lovejoy Type "H" Face Milling Cutter to take the fullest advantage of modern improvements in machines, alloy tips, and metal-removing techniques.

It's a heavy-duty mill—designed for $\frac{3}{4}$" depth of cut. That's the reason for the husky, rugged build—the tough, forged-steel body—the heavy **one-inch** blades—the solid backing of the blades—the generous chip clearance.

This rigidity and compactness is completed by the method of holding the blades in the body: Lovejoy's famous **positive-locking** device. This means that even heavy intermittent cuts cannot loosen the blades. It also means that the blades can be moved up—in the line of wear—until **all** of the extra large carbide tips are used up.

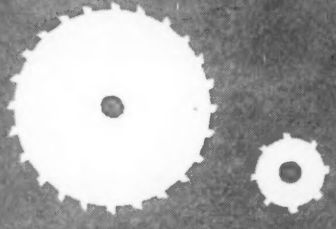
All blades are accurately machined for interchangeability, and all blades for Type "H" cutters can be interchanged throughout the complete range of sizes (6 to 24 inches dia.).

The Type "H" is being used for negative-rake milling with complete success. It is available for any type of drive or mounting—and with either HSS, cast alloy, or carbide-tipped blades. Write for further information.



DESIGN

A complete engineering service, backed by an experienced staff, is at your service to make recommendations and design special cutters.



RANGE

Hundreds of sizes, dozens of models to meet every requirement, regardless of machines used or materials to be cut.

SERVICE

Even special tools use standard parts which are stocked by us. There are 20 Lovejoy service centers throughout the U.S.A. — there is one near you.

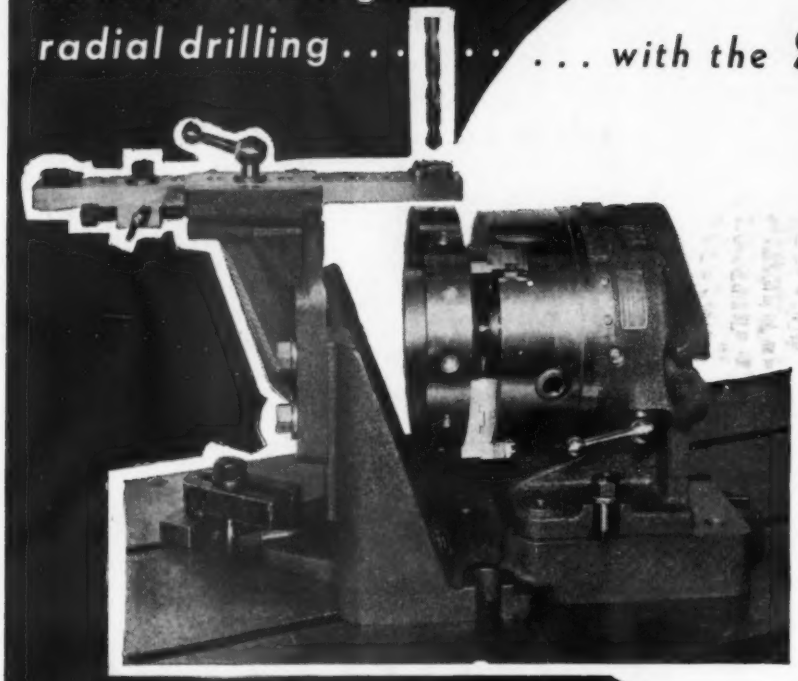
30 YEARS' SATISFACTION

Nearly 30 years' continuous experience making milling cutters and other "Positive-Locking" tools. Our first customers are still buying our tools.

LOVEJOY TOOL COMPANY, INC.
SPRINGFIELD, VERMONT, U. S. A.

A fast, simple way to handle indexing in radial drilling . . .

. . . *with the* **SUPER-SPACER**



HARTFORD

With the Hartford Drilling Attachment secured to the base of the Super-Spacer, time and expense are saved in providing a means of indexing on radial drilling operations. Special jigs and fixtures are not required. As shown here, the application of the Super-Spacer provides for taking care of variations in length and diameter as well the means of setting up work in shortest possible time. Indexing is fast and accurate, all possibility of error being eliminated by the use of mask plates which are an exclusive feature of this device.

Other indexing operations being speeded up by the Hartford Super-Spacer include, milling, plain drilling, slotting, grinding, planing and jig boring . . . on single piece work as well as mass production.

The **HARTFORD**
SPECIAL MACHINERY CO.
HARTFORD 5, CONN.

INVESTIGATE by sending at once for illustrated literature showing some of the many applications of the Super-Spacer.

INTERCHANGEABILITY

Your KEY to MASS PRODUCTION
Will Speed up Drilling and Lower Costs

A. S. A. STANDARD
PRECISION DRILL JIG BUSHINGS

Standard sizes and styles in stock for prompt delivery. Write for catalog showing table of standard sizes of bushings with price list and other valuable information for the tool designer.

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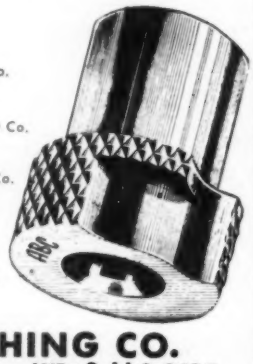
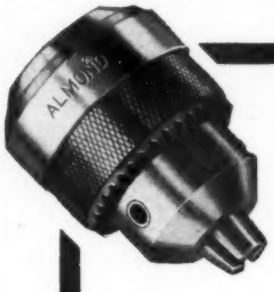
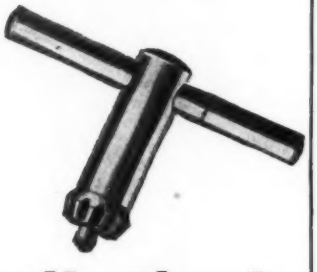


ACCURATE BUSHING CO.
440 North Ave., Garwood, N. J. • WEstfield 2-2415





Almond Drill Chuck

THE FIRST IN THE FIELD

ALMOND THREE-JAW DRILL CHUCKS were the first to be placed on the market over Seventy years ago. As Pioneers in the field of Drill Chucks, the name "ALMOND" has long been associated with the logical procedure of machine developments. ALMOND DRILL CHUCKS are made in types and sizes to fit all machine tools and portable drills.

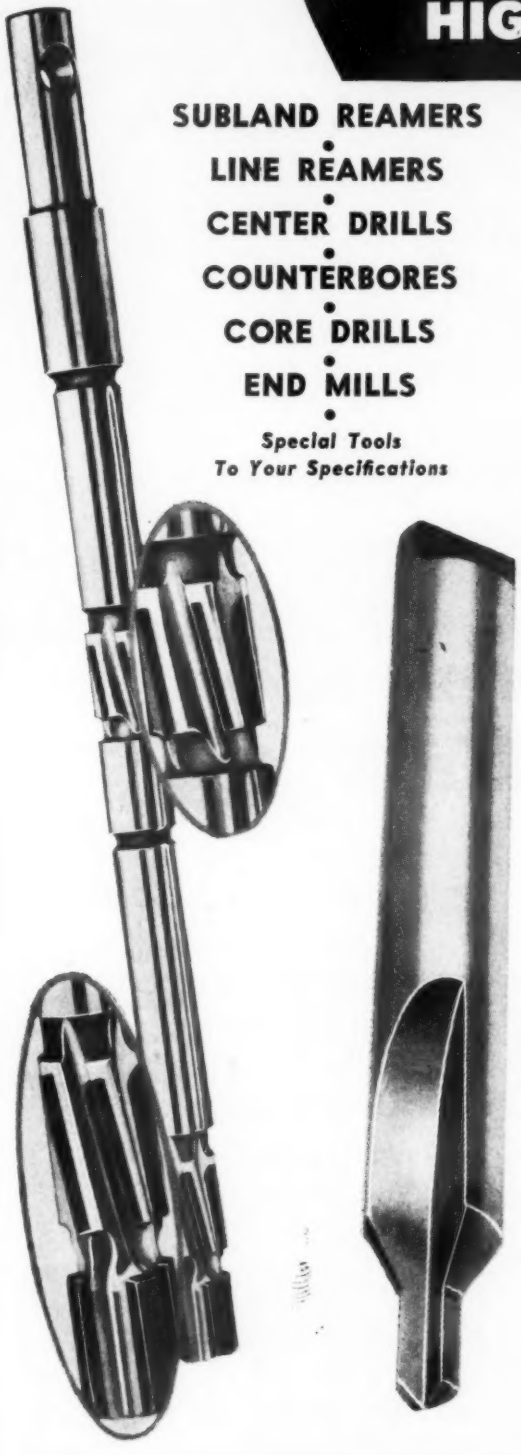
Complete information is available on request.

The Original Manufacturers of Drill Chucks

T. R. ALMOND MFG. CO.
Ashburnham, Mass., U.S.A.

Now!

CARBIDE-TIPPED TOOLS
BRAZED OH HARDENED
HIGH-SPEED STEEL BODIES



SUBLAND REAMERS
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LINE REAMERS
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CENTER DRILLS
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Special Tools To Your Specifications

AGAIN, Detroit Reamer & Tool Company sets the pace in metal cutting tools, with brazed carbide tips on hardened high-speed steel bodies, so that the total length of flutes and pilots will Rockwell C-62-63.

It has also been proved in actual practice that this type of tool has a higher cutting efficiency due to the harder background for the carbide tips which produces less "spring-back" under heavy cuts for this same reason. Also, the flutes and pilots will not "score" or pick up due to the hardness of the high-speed steel and long wear on the pilot.

All of these outstanding advantages, together with longer tool life and reduced production costs, are at your disposal with Carbide Tipped Cutting Tools, with HIGH-SPEED STEEL BODIES.

• ***MADE TO YOUR SPECIFICATIONS*** •

DETROIT REAMER & TOOL CO.
2830 E. 7-MILE ROAD DETROIT 12, MICHIGAN
Manufacturers of Oil-Hole Drills, Subland Drills, Special Reamers, Circularity Relieved Reamers, End Mills and Special Tools.

Immediate Delivery

HIGH SPEED STEEL, STRAIGHT SHANK

TWIST DRILLS

EXTRA LENGTH

9' CUTTING FLUTES—12' LONG DRILLS

SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET	SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET
1/8"	12	9	$1.50	21/64"	12	9	$2.25
9/64"	12	9	1.50	11/32"	12	9	2.25
5/32"	12	9	1.50	23/64"	12	9	2.50
11/64"	12	9	1.50	3/8"	12	9	2.50
3/16"	12	9	1.50	25/64"	12	9	2.75
13/64"	12	9	1.60	13/32"	12	9	2.75
7/32"	12	9	1.60	27/64"	12	9	3.00
15/64"	12	9	1.75	7/16"	12	9	3.00
1/4"	12	9	1.75	29/64"	12	9	3.25
17/64"	12	9	1.85	15/32"	12	9	3.25
9/32"	12	9	1.85	31/64"	12	9	3.25
19/64"	12	9	2.00	1/2"	12	9	3.25
5/16"	12	9	2.00				

HIGH SPEED STEEL, TAPER SHANK

TWIST DRILLS

EXTRA LENGTH

SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET	SIZE INCHES	LENGTH OVERALL INCHES	LENGTH FLUTES INCHES	PRICE EACH NET
17/32'	15	12	$6.50	27/32"	15	12	$11.50
9/16"	15	12	7.00	7/8"	15	12	12.00
19/32"	15	12	7.50	29/32"	15	12	12.50
5/8"	15	12	8.00	15/16"	15	12	13.00
21/32"	15	12	8.00	31/32"	15	12	14.00
11/16"	15	12	8.25	1"	20	15	16.00
23/32"	15	12	8.50	1-1/16"	20	15	17.00
3/4"	15	12	8.50	1 1/8"	20	15	18.00
25/32"	15	12	9.50	1-3/16"	20	15	20.00
13/16"	15	12	11.00	1 1/4"	20	15	22.00

Victor Machinery Exchange

INC.

251 CENTRE STREET **NEW YORK 13, N. Y.**

PHONE: CAnal 6-5575

ALL WRAPPED UP IN A
SMOOTH,
SEALED PACKAGE

THE POPE
6" x 18" SURFACE GRINDER SPINDLE
WITH G-E MOTOR *Sealed In*

Here's a streamlined Spindle that goes on the job and keeps on running at peak efficiency without attention.

Note particularly the *smooth, sleek* housing of the *sealed-in* motor — the result of *smooth* teamwork by POPE and GENERAL ELECTRIC engineers. This motor runs cool and delivers full 1 HP at the wheel.

You can see for yourself that there is no fan, no air passages, no openings of any kind. Dust and dirt are sealed out of both motor and bearings.

The lubrication is permanently sealed in — no time out for maintenance, no danger of running dry.

Pope Precision Spindles like this give you better final finishes.

Ask for Data Sheet No. 12.

No. 35

POPE
POPE MACHINERY CORPORATION
ESTABLISHED 1920
261 RIVER STREET · HAVERHILL, MASSACHUSETTS
BUILDERS OF PRECISION SPINDLES

EDWARD

Blake

COMPANY

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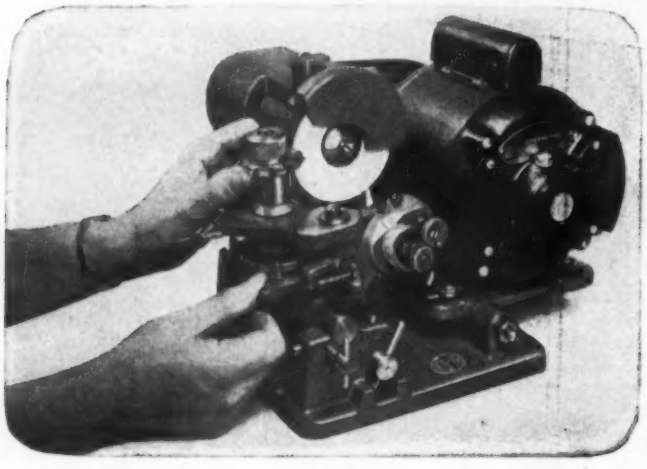


Waltham CUTTER SHARPENER

Maintains Original Accuracy on your Small Circular Cutters AT SURPRISINGLY LOW COST

USING the right kind of a tool makes any job simpler and cheaper. That's why it's easier, quicker and more economical to sharpen your small circular cutters on the Waltham Cutter Sharpener. It is designed especially to restore "original" keenness to tools such as gear and thread milling cutters, straight-fluted hobs, or multiple cutters—from the smallest size up to 3½ inches in diameter. And the Waltham is so simple to use that unskilled labor can sharpen cutters after brief instruction.

The Waltham can be used for rake or radial sharpening. It is provided with an indexing plate or may be equipped with a pawl device for locating on the top or back of the teeth. A diamond truing device for dressing the front face of the grinding wheel is standard equipment. An additional diamond angle dressing attachment is now available for truing the back side and the flat of specially formed wheels. Its use makes the Waltham an even more versatile cutter sharpener. Send the coupon for complete construction and operating details.

No machine is better than the cutting edge of the tool it uses.

The coupon below will bring you complete details, without obligation.

Please send me Bulletin No. 345 which gives full details on the Waltham Cutter Sharpener. A.M.

NAME_____ TITLE_____

COMPANY_____

STREET_____

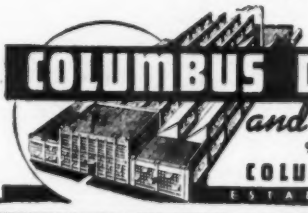
CITY_____ STATE_____

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS—

OUR TOOL DESIGNING saves you time and labor

Today when time is important, correct and efficient tool designing may make the difference between profit and loss. Our experience guarantees you tools—designed for economy of operation, resulting in your increased production at a lower cost.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES



COLUMBUS DIE·TOOL and Machine Co.

945 CLEVELAND AVE.
COLUMBUS 1 OHIO
ESTABLISHED 1906

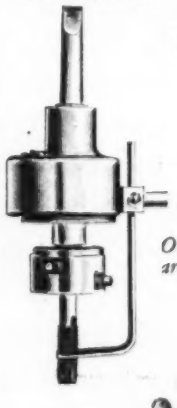
ERRINGTON MECHANICAL LABORATORY

TAPPING CHUCKS

STAPLETON, STATEN ISLAND 4, N. Y.

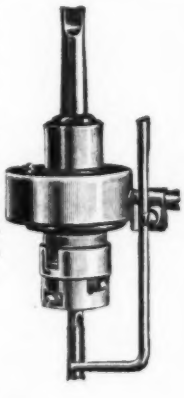
NEW YORK
170 Broadway

CHICAGO
6701 N. Sioux Ave.

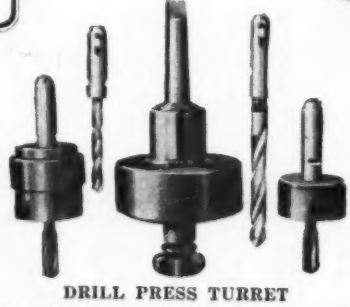


Size	Taps Exact Size
No. 00 H.S.	Up to ¼"
" 00	⅛" " 5/16"
" 0	5/16" " ½"
" 1	7/16" " ¾"
" 2	⅜" " 1 "
" 3	⅝" " 1¼"
" 4	¾" " 1½"
" 5	⅞" " 2 "

Our High Speed Tappers are Super-Sensitive for Small Tapping



Style B Positive Stop Holds Work Down



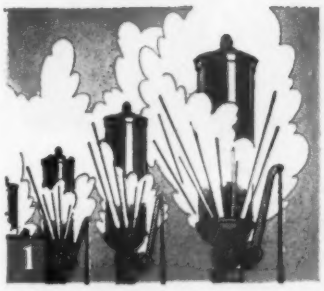
Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder. If required.

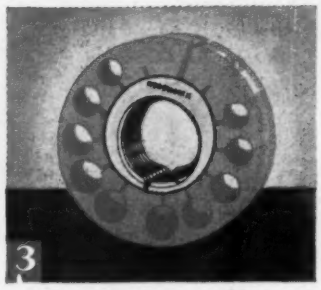
Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

Holy Smokes! They've done it again!

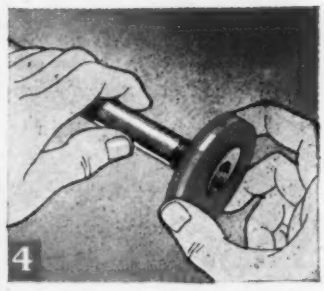


Blow all the whistles! They've done it again!

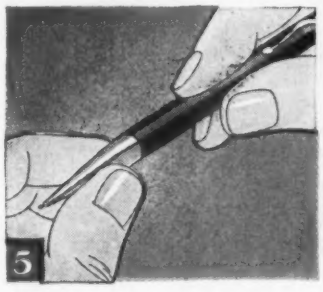
Blast out a fanfare for a great new Woodworth invention!



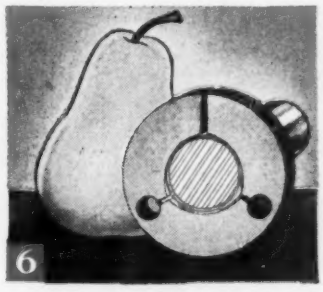
It's the Woodworth Adjustable Thread Ring Gage.



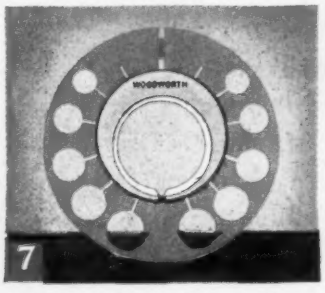
Thread ring gages check the O.D. of threaded parts.



Adjusting 'em as they wear down saves time and money.

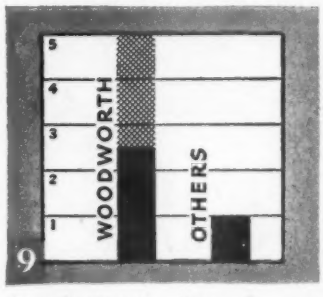


But old types get pear-shaped —lose accuracy—wear out fast.

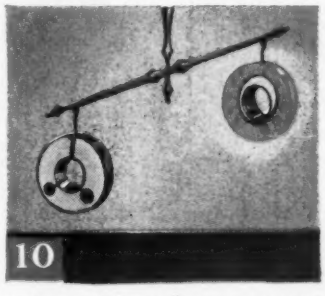


This Thread Ring Gage adjusts perfectly — *stays round.*

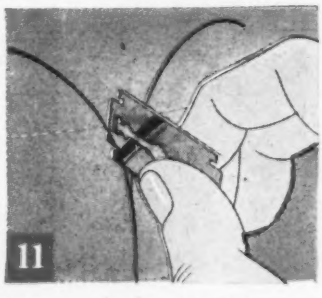
Never gets out of line when dropped or thrown about.



Equal distribution of wear increases life 2½ to 5 times.



Light weight reduces operator fatigue — increases sensitivity.



It's amazingly accurate . . . ideal for hair-splitting work.

Woodworth's New Thread Ring Gage is an all-time champion!

Another Woodworth contribution to production

THE NEW Adjustable Thread Ring Gage, another revolutionary Woodworth instrument of accuracy, is now available to industry!

Employing an entirely new principle of design, and proven mathematically correct by actual tests, this gage assures roundness through the maximum range of adjustment.

Check these
Five Important Advantages

1. *Greater Accuracy and Stability.* Stays round with adjustment. Threads held in alignment of thread helix angle with adjustment. Will not reject parts that should pass inspection.

2. *Longer Wear Life.* Equal distribution of wear over the full thread circumference, throughout the entire range of adjustment, increases wear life 2½ to 5 times.

3. *Less Weight.* Aluminum alloy outer body halves the weight to greatly reduce operator fatigue and increase sensitivity.

4. *Positive Identification.* Green outer body for GO GAGE and red for NOT GO GAGE saves time for operator.

5. *Positive Adjustment.* Cannot be thrown out of adjustment by ordinary blows or falls that change setting of conventional gages.

You can speed up production and decrease gaging costs on your thread inspection operations with this amazing instrument! Write for completely illustrated folder 46-R.

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DETROIT 20, MICHIGAN

PRECISION GAGES

PRECISION MACHINED PARTS

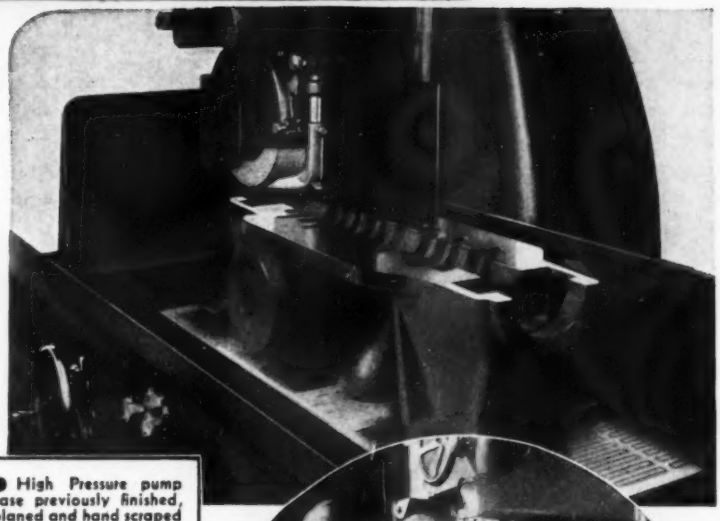
DIAPHRAGM CHUCKS—SPECIAL TOOLS

ADJUSTABLE CLAMPING JIGS

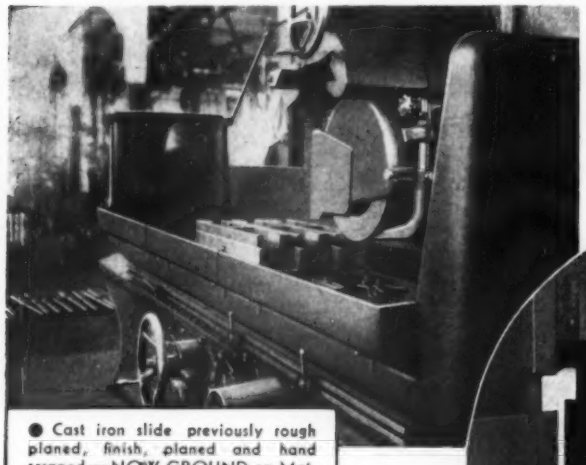
MATTISON GRINDER
Cuts time up to 75%
ON JOBS PREVIOUSLY HAND SCRAPED

Examples: Time on pump case reduced from 40 hours to 4 hours . . . . . Time cut from 12 hours to 3½ hours on slide castings . . . . . Yearly saving on Housings — 22% the cost of machine, etc.

When added together, time savings like this make a big difference in manufacturing cost. To see what Mattison High-Powered, Precision Surface Grinders can do on your work, send us blue prints for production estimates.

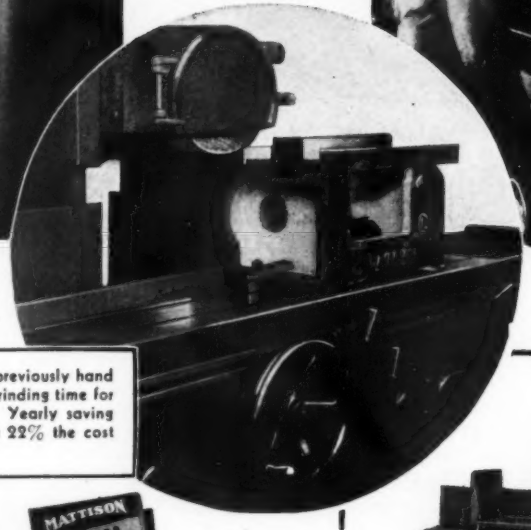


● High Pressure pump case previously finished, planed and hand scraped in from 40 to 48 hours — Now the Mattison Grinder has made these operations unnecessary, reduced time to 4 hours and case comes through with a fine finish and accurate to within .0003".



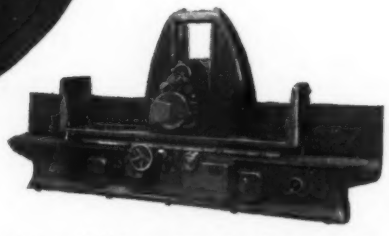
● Cast iron slide previously rough planed, finish, planed and hand scraped — NOW GROUND on Mattison Grinder (6 pieces per set-up) at an 80% savings in time. Finish planing and scraping operations eliminated.

● Cast iron frame previously hand scraped, NOW GROUND top and bottom of casting, shoulder and inside surfaces. 75% time saving.



● Cast iron Housing previously hand scraped in 8 hours. Grinding time for housing is 2.5 hours. Yearly saving on this job alone was 22% the cost of machine.

Write for Free Set-up Book containing further examples, showing how others have reduced time and cut costs with Mattison Grinders.



Mattison High Powered Precision Surface Grinder. Table Sizes: 12" to 36" wide, 36" to 192" long.

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

Do the TAPS you're now using give you these

5 Extra

ADVANTAGES?

1. COLD TEMPER

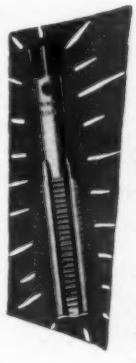
Threadwell High Speed Taps are given deep-freeze treatment at 120° below zero to make them stronger but less brittle. They produce clean, accurate threads and more of them per tap — in steels, cast iron, alloys, plastics and other abrasive materials.

2. "I-DOT-IFICATION"

Threadwell Taps have a *red* dot on the shank to identify cut thread, *white* dot on commercial ground, *blue* dot on precision ground. You know instantly that the tap fits the job.

3. TAP-CAPSULE

Threadwell Ground Thread Taps come in neat, metal-capped, transparent plastic tubes that protect these fine precision cutting tools against dirt and damage yet permit ready selection of type and size without unwrapping or handling.



4. GREASELESS RUST-PROOFING

Threadwell Taps are always clean and dry, ready for instant use, yet always bright and shining because of Threadwell's special greaseless rust-proofing process.

5. "PERSONAL ATTENTION" TO YOUR TAP NEEDS

Threadwell's personal attention policy applies to every order, large or small — at the factory and at the Threadwell distributor's in your locality, for he has been carefully selected to provide prompt, intelligent attention to your needs.

Next time, specify Threadwell Taps and get the Benefit of these Five Extra Advantages.

Threadwell products are sold exclusively thru Mill Supply Distributors

THREADWELL DISTRIBUTORS ARE IN LEADING INDUSTRIAL CENTERS THROUGHOUT AMERICA

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Canada — Bridge Machinery Company, Montreal

England — Skylux, Ltd., London

Brazil — Alfredo Kramer & Cia. Ltda., Rio de Janeiro, Sao Paulo

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John H. Graham & Co., Inc. of New York City

THROUGHOUT THE REST OF THE WORLD

Threadwell

SINCE 1902

"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.

CALIFORNIA OFFICE, THREADWELL TAP & DIE CO. OF CALIF., 1322 SANTA FE AVE., LOS ANGELES 21

Vitrified

Cuts longer between turns

Vitrified Grinding Wheels assure economy in high quantity production fine precision grinding because they cut longer between each wheel truing. Then, too, these long life, strong wheels require less redressing. They can also be depended on to eliminate gumming, glazing and heating.

All these advantages are available regardless of the grinding job, because there is a size, shape and type Vitrified Grinding Wheel for every grinding purpose. The completeness of the Vitrified line makes it possible for any shop to standardize on Vitrified Wheels.

Our engineers will gladly study your grinding operations and point out the savings you can make through the use of Vitrified Wheels.

BORITE—for all kinds and classes of steel grinding.

CARBORITE—for all classes of cast iron, brass, bronze and aluminum grinding.

Also, Silicate, Shellac and Resinoid Bonded Wheels.

VITRIFIED WHEEL COMPANY
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VITRIFIED

Just ONE setting per form
Just ONE continuous motion

"Fluidmotion"

FEATURES:

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Prominent users tell us that they consider "Fluidmotion" Radii & Angle Dressers the finest precision dressing instruments procurable—regardless of cost. They obtain greater accuracy, longer wheel life, and much faster setup and operation.

We'll be glad to send you complete information. Write

*Reg. U. S. Pat. Off.

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Representatives in Principal Cities

This ONE CLAMP gives you MANY ANGLES OF CLAMPING

If you are required to clamp work at different angles from job to job, you should have a KS Model Knu-Vise toggle-action clamp—one of the most versatile clamps made.

By means of an ingenious tear-drop shaped sideplate this clamp permits change of toggle bar to any angle up to 45° without disturbing fixed base. Simply drill a hole in upright plate of base (through hole already provided) at required angle of toggle bar to work—then set with dowel.

Made in 3 sizes to meet wide range of applications—accommodating pressure loads from 650 to 1200 pounds.

KNU-VISE

2217 Eight St., Detroit 16, Mich.

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The ATKINS Blade with the "Curled-Chip" teeth

...AKES A BITE OUT O... RISING COSTS

CASE STUDIES:

An 18", No. 400 Atkins "Curled-Chip" Blade made cuts through 6" nickel steel rods in 16½ minutes at 90 strokes, and 13 minutes at 130 strokes, half the time required by another make of blade—30 minutes per cut at 90 strokes.

SAE 1020 4" rounds cut at rate of 3 minutes 20 seconds with "Curled-Chip" Blade against 7 minutes with former blade.

3.6 square inches per minute on SAE-3135 with Atkins "Curled-Chip" Blade.

On 4" diam. 1020 Steel Atkins 400 blade cuts at rate of 85 seconds per cut versus 165 seconds per cut for previous blade.

4140 steel, 3" diam., cut at rate of 1½ minutes per cut, twice as fast as previous blade. Blade life increased 8 to 10 times.

16 square inches per minute on regular production runs cutting SAE-1020 with Atkins "Curled-Chip" Blades.

...s are going up. But that doesn't mean the ...ce is shut on *all* production savings. Just glance over the actual case studies on this page to see a few of the many places where Atkins Silver Steel "Curled-Chip" Blades HAVE cut costs—and cut them plenty. Thanks largely to the Atkins-developed Curled-Chip tooth, there *is* a way of getting a saw to slice through metal faster—with less power. There *is* a way to get blades to stay on the job longer to reduce downtime—and to cut more accurately, reducing re-machining. Prove it to yourself . . .

. . . Make the "Stop-Watch" Test On Your Work in Your Shop . . . .

Let Atkins "Curled-Chip" Blades tell their own cost-cutting story on work of your choosing in your plant. Compare performance with the blades you are now using. Plenty have said "it can't be done" only to see "Curled-Chip" blades cut at unheard of rates for unheard of cutting periods.

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Or Write To

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HOME OFFICE AND FACTORY:
402 South Illinois Street, Indianapolis 9, Indiana
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Atlanta • Chicago • Memphis • New Orleans • New York
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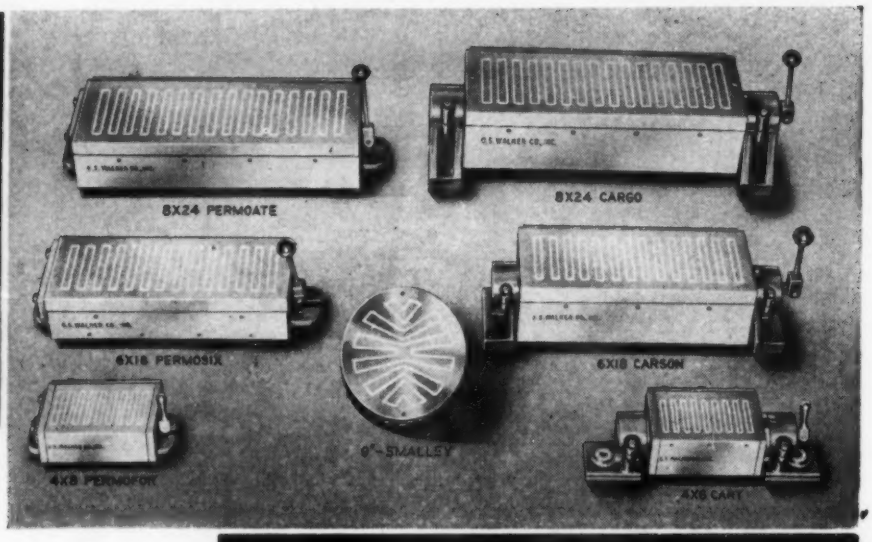
ATKINS

ATKINS BLADES TAKE THE "HACK" OUT OF HACK SAWING

Walker Chucks



Truly a credit to the O. S. Walker Co., Inc.

Over 60 years of chuck building, design, and engineering experience is incorporated into these PERMOS.

WALKER ENGINEERS invite you to present your problems for solution at no obligation.

REMEMBER there is a WALKER CHUCK for every known application.

O. S. WALKER CO., INC.

Original Designers and Builders of Magnetic Chucks

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This is the WALKER PERMANENT CHUCK FAMILY

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on offset holes and blind holes. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-seven different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

ANNOUNCING!

THE NEW Precision LINE OF COLLETS AND FEED FINGERS FOR BROWN & SHARPE MACHINES

IMMEDIATE DELIVERY FROM STOCK

The addition to the *Precision* line of collets and feed fingers designed for use in Brown & Sharpe machines gives you a dependable source for speedy delivery . . . And as always, the *Precision* name on these new collets and fingers is your unconditional guarantee of selected steels, uniformity in machining, grinding and heat treating. You will like their lasting spring quality and hair-trigger accuracy.

DO YOU KNOW THESE OTHER Precision PRODUCTS . . .

Precision lathe collets fit many machines and attachments including 10" Atlas, Logan, Craftsman, Powr-Kraft, South Bend, Clausing, Sheldon, Hardinge, Elgin, Dalton, Schauer, Sebastian, etc.

3AT, 3C, 1A collets, drawbars, adapters

KLUTCH-KOLLET for chucking work to 2¾" dia. Fits 3AT, 3C, 1A, 5C standard adapters. Head soft.

SPEEDICHUK & BREN Collet Increase ½" collet cap. lathes to ¾". For Atlas, Logan, South Bend, Clausing, etc.

KASSON GENERAL DIE AND STAMPING COMPANY
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It pays to specify Precision when collet work is indicated, because you get the best, and you get it promptly from stock. Order from your Industrial Supply Distributor. . . He is ready to serve you. Literature is available. Why not write for it today.

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Often the "special" metal cutting tool you require differs so little from a standard tool that it pays to check your NATIONAL catalog first. Whenever you can use a standard size tool, as listed in the catalog, you can reduce your cutting tool costs.

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TWIST DRILLS
REAMERS, HOBS
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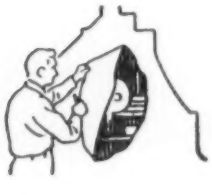
B-29 IN COCOON
for safe-keeping!

The Amazing New Protective Packaging for anything from a ballbearing to a locomotive

Applied with a spray gun, Cocoon provides a simple, extremely fast means of packaging parts, assemblies, *or complete machines*, regardless of size or complexities in shape—brings an entirely new meaning to "Protective Packaging!"

COCOON requires only a spray gun and air supply! • Bridges gaps up to 20 inches without difficulty! • Equipment can be stored or shipped without dismantling! • Assures full protection without grease coatings! Tensile strength 2000 lbs./sq. in.; elongation 200%! Won't soften at plus 180°F; remains flexible at minus 40°F! • Has extremely low moisture-vapor transmission rate! • Resists attack by major mildew and mold groups!

Whatever *your* "Protective Packaging" problem may involve—from a ballbearing to a locomotive—Cocoon may be the answer. Imagine your product protected by Cocoon. Submit your problem to us for analysis. *R. M. Hollingshead Corporation, Coatings Division, Camden, New Jersey; Toronto, Can.*



Cocoon can be stripped from machinery or equipment in minutes; strips off easily in long, continuous sheets!

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A PRODUCT OF
Hollingshead
LEADER IN MAINTENANCE CHEMICALS

THERE ARE 7 FACTORS TO CONSIDER WHEN YOU BUY GAGES

1 . . DESIGN

Better design makes a gage easier and faster to use. VARD gages incorporate the best of the postwar gage design engineering.

2 . . MATERIAL

A well designed gage is a good buy when its basic material fully meets use requirements. VARD gages are made of Timken Graph-Mo steel, hard chrome plate or Norbide (Norton Company's boron carbide).

3 . . GRINDING

VARD gages are shaped on batteries of modern grinding machines — in temperature controlled rooms by expert gagemakers. Are ACCURATELY ground.

4 . . INSPECTION

Microscopic inspection equipment is necessary for gage testing. VARD owns visual and mechanical testing equipment of all types, reading to .000001-inch accuracy.

5 . . PACKAGING

A gage properly made must still be safely delivered into your hands. VARD gages are wrapped in shock-resisting packing and then sealed in individual boxes. Small gages are sealed in plastic tubes.

6 . . AVAILABILITY

VARD stocks most sizes of standard thread and dimensional gage. Our dealers also can supply you. Special gages are now produced in record time.

7 . . SERVICE GUARANTY

VARD guarantees its products against all defects of materials or workmanship. Moreover, VARD can rebuild or renew your worn gages.

Write for the VARD Gage Catalog — Ask for data on gages you need.

VARD INC.
Gagemakers

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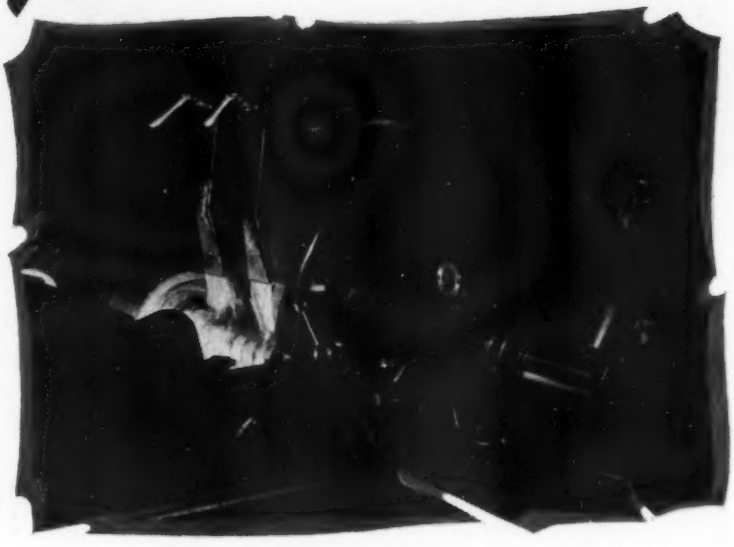
PASADENA 8, CALIF., U.S.A.

"Quality Improved 100%"



SINCE CHANGING TO *Tycol soluble cutting oil"*

"Threads are as smooth as silk...
No rejections or ragged cuttings...
Easier to work with—transparent, odorless...
Glass-like surfaces...
High anti-welding properties..."

Every day, more and more plants are learning . . . in dollars and cents . . . how Tycol Soluble Cutting Oil is improving quality . . . stepping up production . . . drastically reducing cutting time.

For full information about this modern lubricant contact your nearest Tide Water Associated Office.

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TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE - NEW YORK 4, N.

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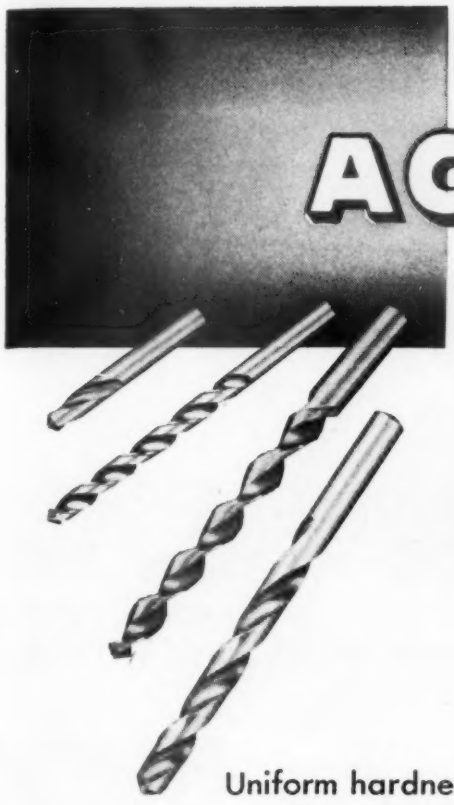
LUBRICATION—"ENGINEERED TO FIT THE JOB"

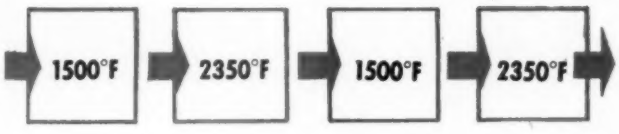


ACE DRILLS
are ground from the solid

Ace Drills give longer service because the flutes are ground from solid bars that have been double-dip hardened. This method of hardening is practical only when all surface damage can be completely removed by grinding.

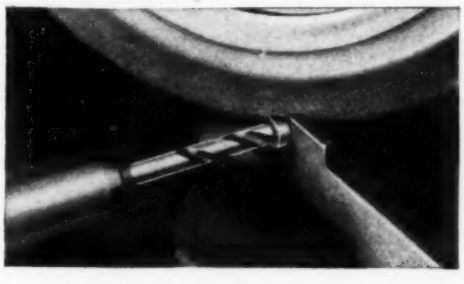
Surface damage removed by centerless grinding.

Uniform hardness and toughness is possible because the mill length bars of high speed steel are passed through the high steady heat of a 22 foot long furnace in a continuous line . . . bar after bar. The rods enter the furnace through small flame sealed openings which maintain uniform furnace conditions not possible with batch type hardening processes.



Sketch showing the 22 foot long, 4 section hardening furnace through which round bars 12 feet long are fed in a continuous line. Double-dip hardening produces a greater carbide solution while maintaining a satisfactory grain size so important to toughness. This means that more effective hardness is retained despite increased temperatures during drilling. (Do not confuse double hardening with double tempering. Ace Drills receive multiple tempering.)

The polished flutes of Ace Drills are ground into the perfectly hardened blank leaving the metallurgical structure gained in hardening undisturbed. The cutting lips are keener and more even because they are formed by the intersection of two ground surfaces rather than a milled surface and a ground surface. This increases the cutting ability of the drill and adds to the drill life by reducing the number of sharpenings.



PATENT NO. 2034514

ACE DRILL CORPORATION

GROUND FROM THE SOLID

DETROIT 27, MICHIGAN

Buy...

• VICTOR MOLY HIGH-SP

• VICTOR U SP

1. SPEED—The correct setting of the teeth in Victor Hack Saw Blades assures fast cutting and full side clearance.

2. RELIABILITY—Victor Blades lessen shutdowns on the job. They are tough and durable.

3. QUALITY—The fine grade of high-speed steel, scientifically heat-treated, makes Victor Blades superior tools.

4. SERVICE—Like old friends they wear well—and long, because they are BETTER blades in every way.

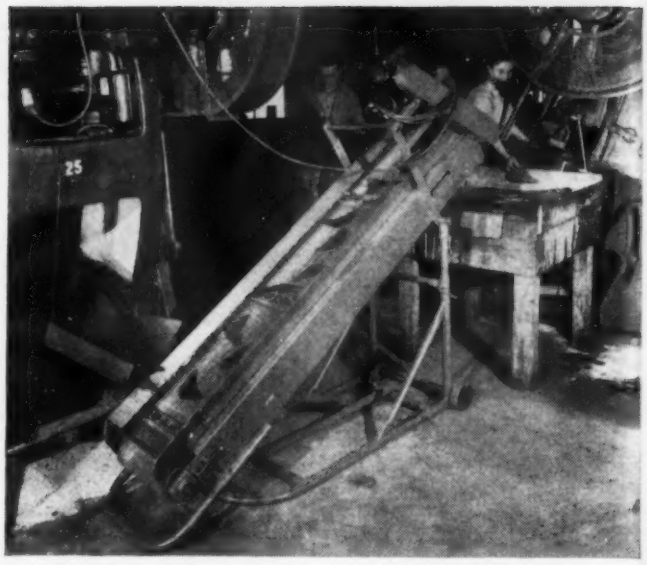
Guide to Better Sawing

Send for a copy of this pocket-size booklet on how to select, use, and care for a hack saw blade.

VICTOR

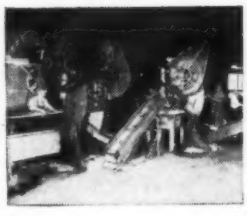
VICTOR SAW WORKS, Inc., Middletown, N. Y.

Makers of hand and power hack saw blades, frames, and metal cutting band saw blades.



BETWEEN MACHINES **PRODUCTION FLOW-WAY**

THE RAPIDS-STANDARD *Press-Veyor*



Keep small parts flowing steadily between machines . . . eliminate stock handling men . . . reduce worker fatigue . . . efficiently mechanize your entire production line . . . with the **Rapid-Standard Press-Veyor.**

Readily portable, the Press-Veyor is a power driven, endless belt conveyor that can be used anywhere in the plant. Where small parts and scrap are otherwise carried by hand, the **Press-Veyor** "Production Flow-Way" reduces accident hazard through better shop housecleaning . . . carries production along smoothly. Fatiguing, time-consuming, "shovel and lift" methods are eliminated.

Rugged in construction, the **Press-Veyor** is built of heavy-gauge steel, to withstand the hard abuse of stamping room operations. It is adjustable at both delivery and receiving ends . . . built in 6′ and 8′ models to meet a wide range of operating conditions.

For more details on stepping up production in your small parts operations, write for the new Press-Veyor Bulletin.

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Whether the job calls for careful finishing of a large surface, or painstaking filing of a fine opening—if precision is required, you'll be *sure* of best results if you choose from the more than 3000 shapes, cuts and sizes of "AMERICAN SWISS" Swiss Pattern Files.

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Preferred By Makers

Of Screw Machine Products

An impartial canvass of the screw machine products industry revealed a decided preference for the H & G Insert Chaser Die Heads. Seventy-seven per cent of the respondents gave preference to this make.

Here's one reply from a western plant that uses three different makes of die heads: "*H & G Insert Chasers are more economical to buy and the hardening seems more uniform.*"

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These two reports show the trend and furnish food for thought to the head of any automatic screw machine department who is NOT NOW benefiting from the advantages of the high production, less down time, and very satisfactory performance of H & G Insert Chaser Die Heads.

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This handy device eliminates laborious calculations and gives the proper speeds for different materials for all diameters. FREE if requested on business letterhead. Otherwise, 15c.

Simple
Strong
Accurate

Sizes and styles for all machines on which threads are cut. Write for literature.

THE EASTERN MACHINE SCREW CORP.

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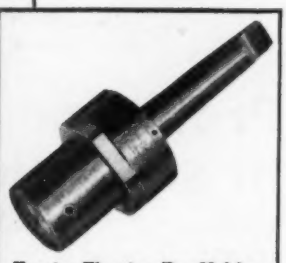
Manufacturers H & G General Purpose Die Heads, Insert Chaser Die Heads, Threading Machines, Feed Fingers

Empire Floating Tool Holder corrects out-of-parallel and angular misalignment.



Empire Floating Tap Holder permits tap to float freely in and out, and will not freeze under tension caused by drag of tap.

The distinctive T-shaped design of Luers Patented Cutting-off Blades provides extraordinary clearances. Excessive friction is thus eliminated and useful life of tool extended. Holders are available for all standard machines.

THESE EMPIRE TOOLS NOW STANDARD

equipment on New Warner & Swasey 1¾" Bar and 6" Chucking Multiple-spindle Automatics, which eliminate cam changes.

Empire Tool Company manufactures Luers Patented Cutting-off Blades and Holders under license issued by John Milton Luers Patents, Inc.

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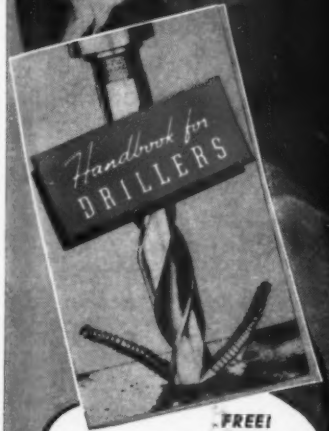

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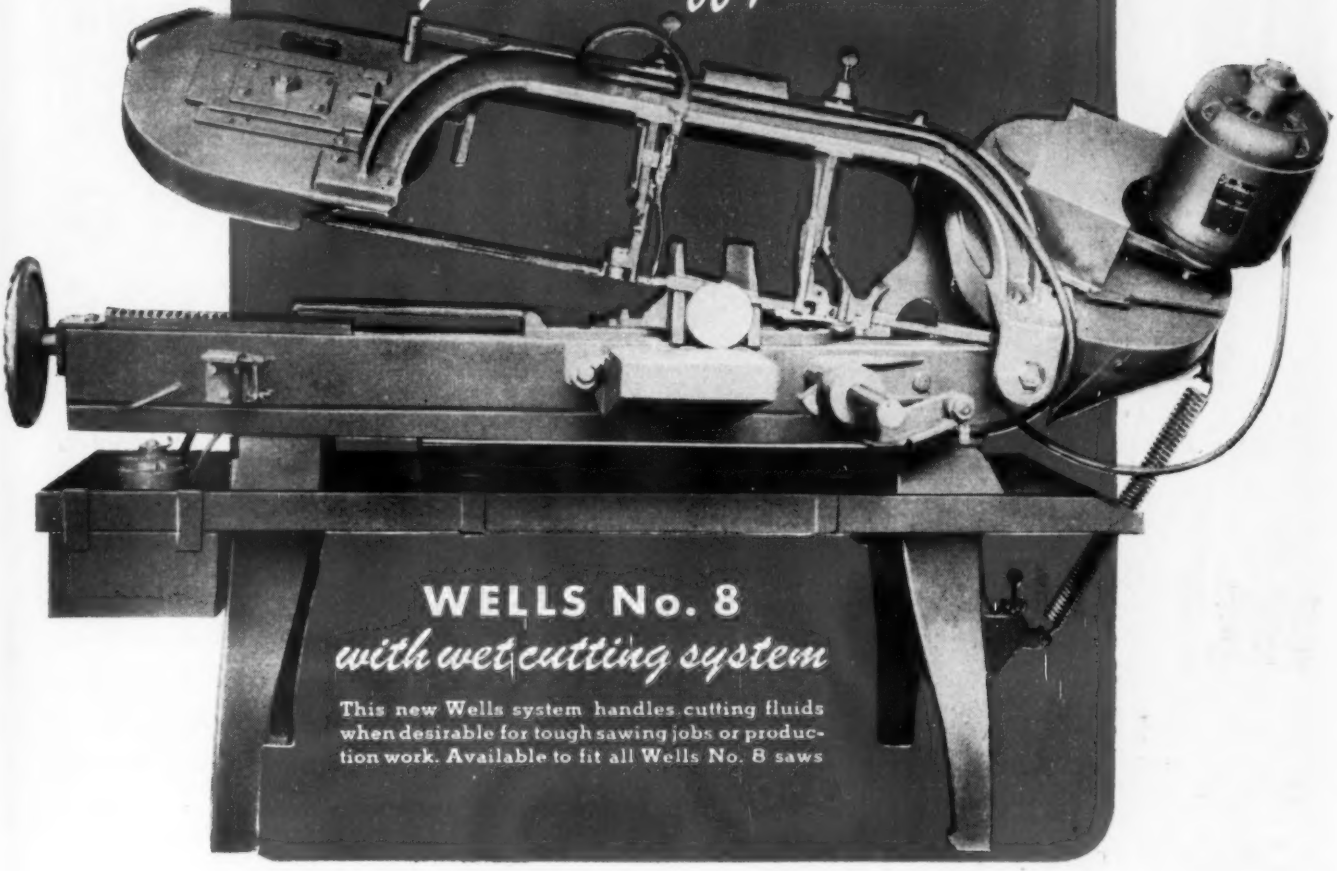

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with wet cutting system

This new Wells system handles cutting fluids when desirable for tough sawing jobs or production work. Available to fit all Wells No. 8 saws

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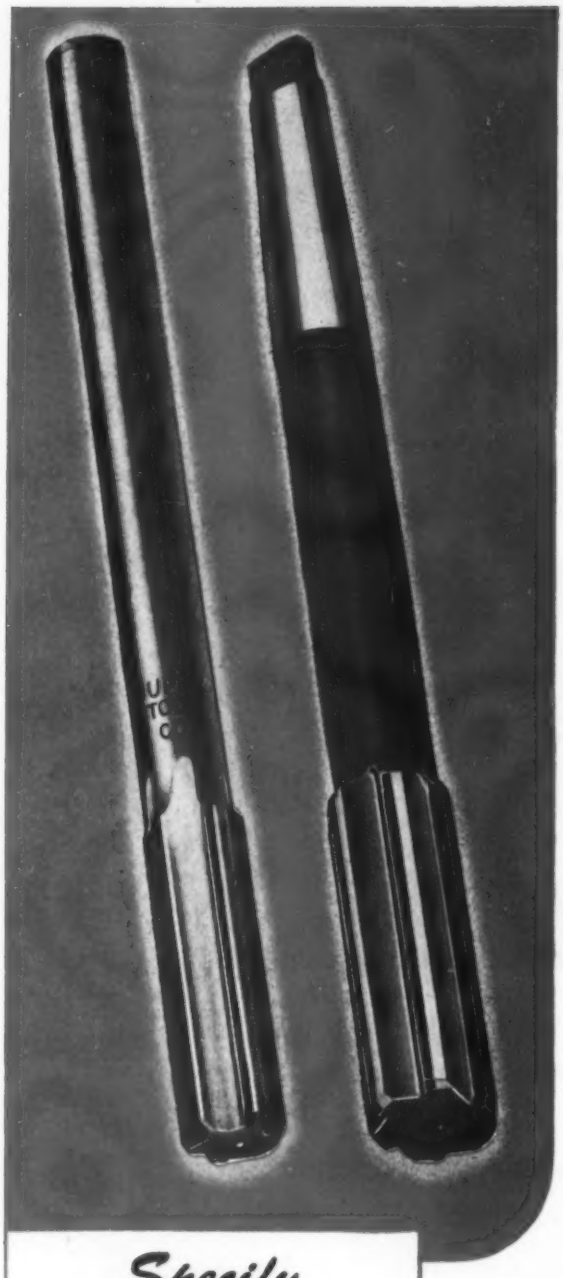
HERE IT IS!



SUPER'S NEW REAMER WITH FLUTE LONG CARBIDE TIPS

Supplied in sizes from ¼" to 1½" diameter. Delivery of practically all sizes from stock.

You will find the Super FLUTE LONG CARBIDE TIPPED solid reamer gives you finer finishes, as scoring and galling due to worn flutes is eliminated. This is particularly true when reaming in Cast Iron and other abrasive materials. Grind time in the tool room will be cut down and the life of the tool in general is greater.

Try some now . . . Check performance and cost against that of older type Carbide reamers.

CARBIDE TIPPED FULL LENGTH FLUTES

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LESS TIME IN TOOL ROOM

MORE GRINDS PER TOOL

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Specify
SUPER
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For Turning, Facing, Reaming, Milling, Forming, Spot Facing, Boring, Grooving, Grinder Rests, Wear Parts, Counterboring, Shaving, Centers, and Special Purposes.

SUPER TOOL COMPANY

Carbide Tipped Tools

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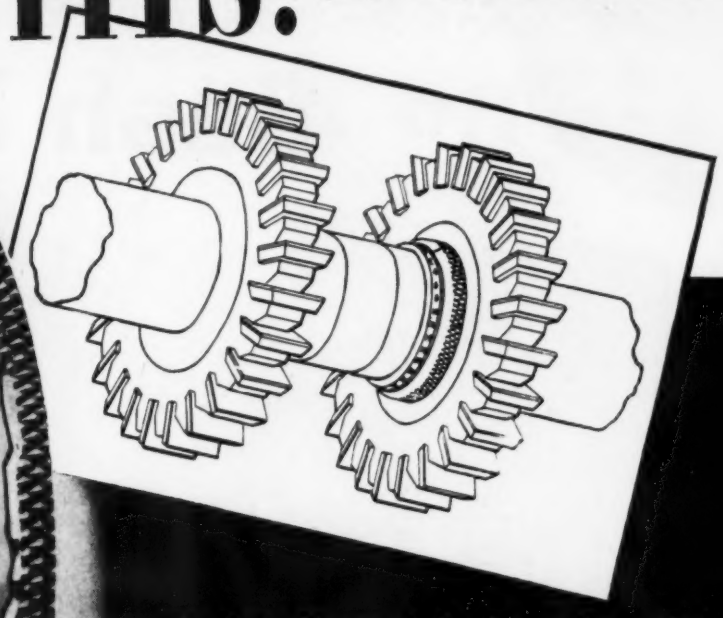
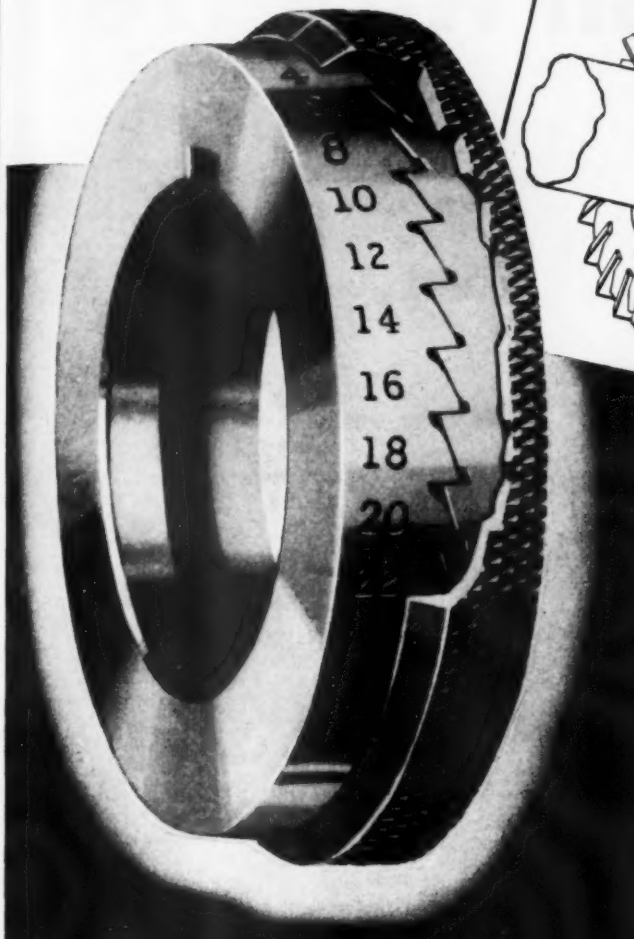
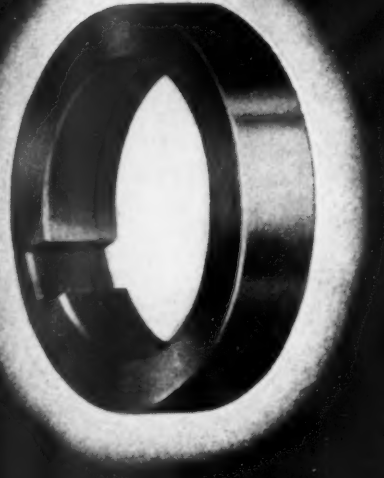
GIVE 'EM FITS!

Here's how to "fit" the exact spacing requirements between cutters, in straddle or gang milling and multiple slotting setups.







S. J. Adjustable Spacing Collars

—manufactured exclusively by Scully-Jones, can be adjusted to make a perfect "fit," to the exact decimal space needed between cutters, without removing cutters from arbor to mount shims.

These adjustable collars have an expansion of .002" per step and a maximum expansion of .024". The teeth have a three-point bearing, at all times assuring uniform parallelism of the sides. They are hardened and ground and each tooth is ground on the side and face.

Count the Cost—Compare the Accuracy

—of Solid Spacing Collars made in your own shop—and you'll choose

S. J. Solid Spacing Collars

These Collars are carefully heat treated,* and widths are ground parallel to .0005 plus or minus.

Prompt delivery can be made on the standard sizes of S. J. Solid Spacing Collars.

*Except sizes of less than ⅛" thick.

See pages 128 and 129 Scully-Jones Catalog No. 500 for Adjustable and Solid Spacing Collars.

Write us for further information.

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

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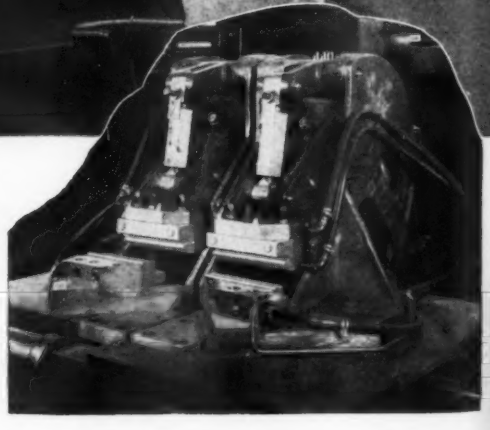
1918

Weld after removing flash

Flash-Welded Sash Hits New



IT'S A FEDERAL F-4 SASH WELDER

FLASH BUTT WELDING SETUP →

FLASH MITRE WELDING SETUP ←

THE Federal MACHINE

BULLETIN SP 346—Describing Federal Spot, Flash, Projection, Seam and "Gun" Welders is yours for the asking

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Aluminum (or Steel) Production High on Federal Welder

manufacture of strong, light-weight metal sash received a great etus when Federal pioneered development of resistance welders to omatically weld butt or mitre joints of intricate cross sections.

ow takes about one second of welding time to flash a mitre joint nger than the parent metal on the Federal F4 Flash Welder shown eft. It is typical of present day equipment which is helping fabricators aluminum sash, frames and doors to attain a new high production ut . . . speeding production of modern bus bodies, aircraft, feather-ght storm sash, and the like. This "four-in-one" machine, equipped combination cams (a new feature) is adaptable to either aluminum teel sash, with simple changes of gears and tap settings. In addition, elds either mitre or butt joints. Alternate setups are made simply by ting the clamp assemblies as shown in the smaller illustrations.

ew of the many special sections now being production welded in inum are shown at right. Production rates vary with the cross-section method of loading, but all are in high out-put range that makes r methods unprofitable by comparison.

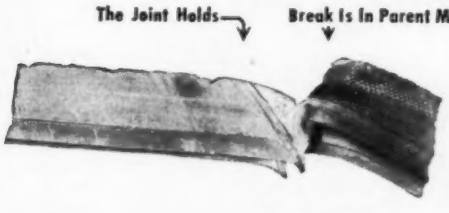
as the evidence shows, is the modern way to make metal sash of istently good quality, free from distortion, with rigid unbreakable s, which finish nicely. It is typical of the short-cutting, cost-saving hods possible in all sorts of metal fabrication with the use of Federal stance welding. It's time to find out how this applies to YOUR production.

Some of the special aluminum sections welded on Federal Sash Welders are here shown with test-cuttings to disclose the thoroughness of weld throughout the section. Note that in many cases the two sections mitre joined are not alike either in size or shape.

E US AT THE METAL SHOW

making your plans for attending the tional Metal Congress at Atlantic City, vember 18 to 22, make a note of Ex-it No. F-125, on the main floor of the ditorium. Federal Welders and Warco sses and Press Brakes will be shown te in a mighty interesting production monstration.

NOTE THIS TEST:



AND WELDER COMPANY

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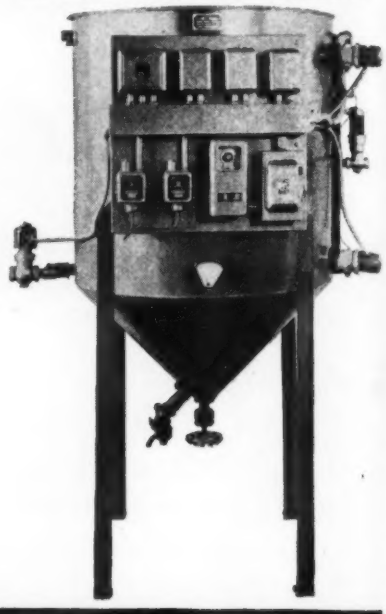
with the NEW BARRETT COMBINATION STERILIZER AND SEDIMENTOR for CUTTING OILS . . . .

Barrett Sterilizer and Sediment Precipitator arranged for fully automatic operation.



Protects your operators against infection—insures more and better work from your cutting tools—by sterilizing your cutting oils and precipitating sediment *at the same time.*

The NEW BARRETT STERILIZER AND PRECIPITATOR combines these two operations in one piece of apparatus, which can be depended on to handle both operations effectively, efficiently and economically. Sterilization is by heat and is a positive active operation in the line ahead of the supply tank. By locating in this position, contamination is intercepted before the cutting oil is conditioned for safe, bacteria-free reuse.

Because of the heat to which the oil is subjected during sterilization, the viscosity of the cutting oil is reduced, thereby encouraging precipitation of minute heavy particles. The sediment thus liberated settles out and drops by gravity to the bottom of the sterilizer where provision is made to scrape the precipitated solids from the conical bottom and clean them out.

By thoroughly and constantly sterilizing and effectively removing solid matter, the Barrett Combination Sterilizer and Sedimentor reconditions cutting oil for reuse; sterilized for safety's sake and abrasive-free for longer tool life.

GET COMPLETE INFORMATION NOW

These units are available for floor, wall and post mounting and are furnished with semi-automatic or full automatic control as required. Send at once for detailed information on this timely Barrett development.

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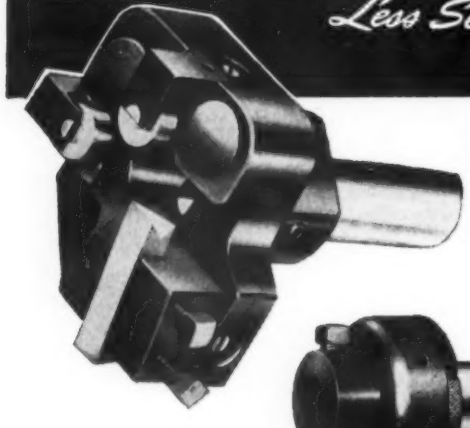
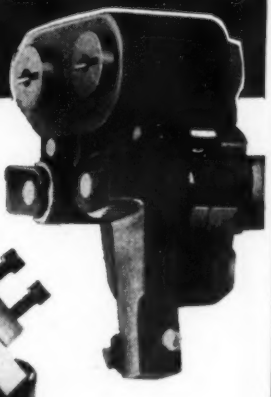
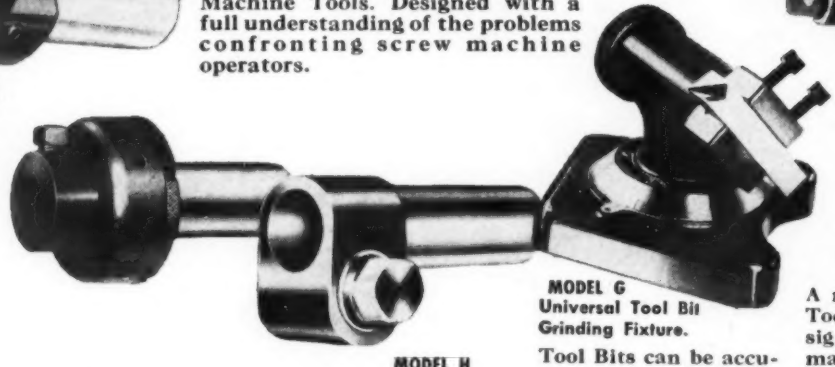
BOYAR-SCHULTZ *Full Time* SCREW MACHINE TOOLS

Less Set-up Time Less Down Time More Production





Much of the costly delay in setting up screw machine jobs can be avoided with Boyar-Schultz Screw Machine Tools. Designed with a full understanding of the problems confronting screw machine operators.



MODEL T Turning Tool.

A new, improved Screw Machine Tool designed with special emphasis on quick accurate set up for precision turning. Less down time is the result of speed in adjustment. Model T Screw Machine Tool is made in five sizes—Nos. 000, 00, 0, 2 and 3.

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For reaming, counterboring and drilling to close tolerances. In 8 Sizes. No. 000—to No. 6.

MODEL H
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A permanent Tool that permits the use of more than one size screw machine tool on a given size screw machine. Made in 6 Sizes.

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Tool Bits can be accurately and uniformly ground with any desired chip clearance angles. Uniformly ground tool bits save time in set-up, save tool steel and save time in grinding.

MODEL K
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A new Screw Machine Tool of outstanding design and construction making it possible to perform many of the knurling jobs formerly considered impossible with tools of other types. Speedy in operation, giving clean, accurate knurling in a minimum of time.

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*Crescent**

Snaps on radially where axial assembly is impossible. No special tools needed.

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There's a Waldes Truarc precision-engineered ring to answer every need. Truarc Retaining Rings give a never-failing grip because of their mathematically precise construction. No matter how demanding your specifications, it's a simple matter to refine your present designs to save material, machining and assembly costs. Waldes Truarc engineers will help you, will give your particular problem individual attention without obligation.

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—to cut down idle time of machines

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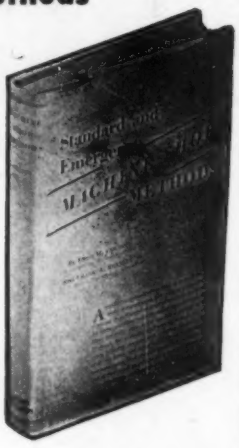

This manual of machine tool methods gives both standard practice and also many ingenious substitute uses developed to meet war production emergencies. It covers many different jobs in turning, boring, and other operations, giving full details of actual cases in which time and trouble, and even complete hold-up of production, was avoided by applying machines to jobs they were not intended to handle.

STANDARD and EMERGENCY MACHINE-SHOP METHODS

By FRED H. COLVIN
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and FRANK A. STANLEY
Editor, *Western Machinery and Steel World*

333 pages, 5½x8½, fully illustrated, $3.50

Here is a mine of ideas for any machinist, in devising methods for handling difficult or unusual jobs. More than this, by showing scores of usable and adaptable ideas for using machines in different ways, the book gives invaluable aid to the shop owner and operator in saving production time when the normal machine for the job is laid up, busy, or otherwise not available, and in profitably increasing the variety of work handled by his shop.

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—mounting drills upside down
—using weights for feeding spot-facing tool
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—improvised drilling machine for marine stern-tube liners
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—metal sawing by frictional heat—and many others

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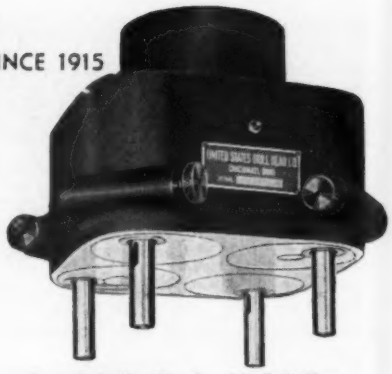

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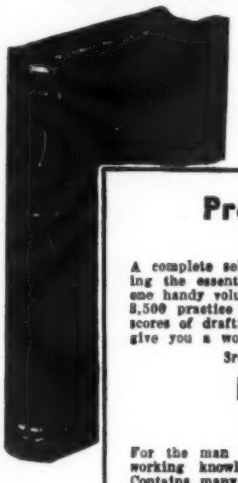

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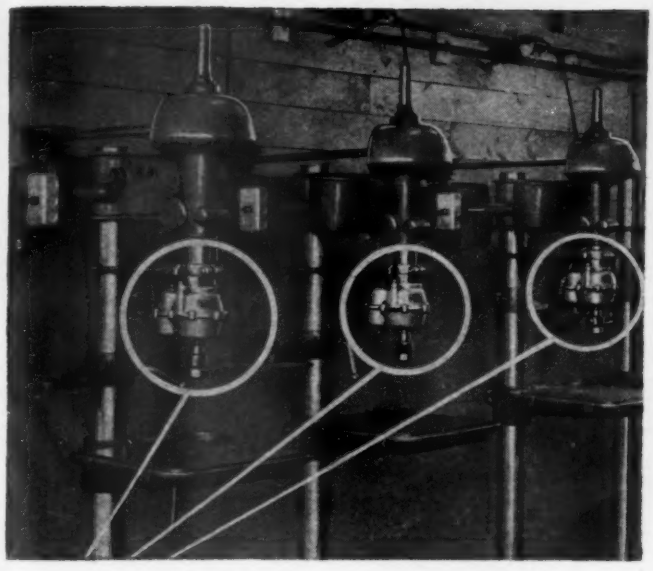

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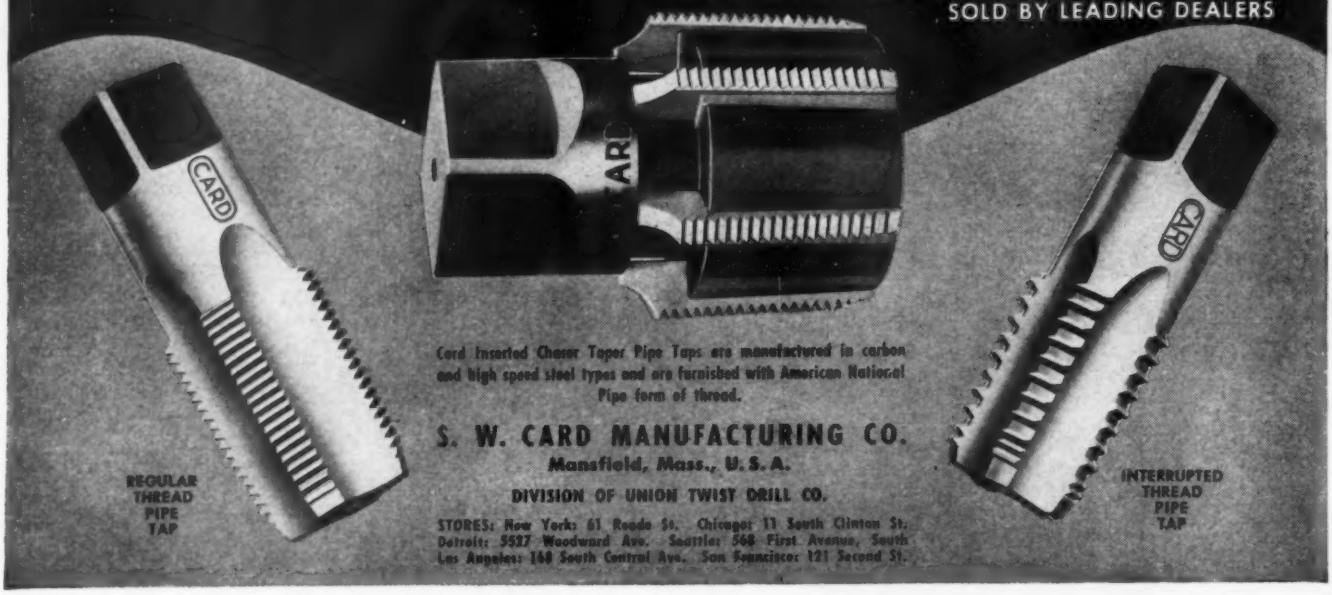

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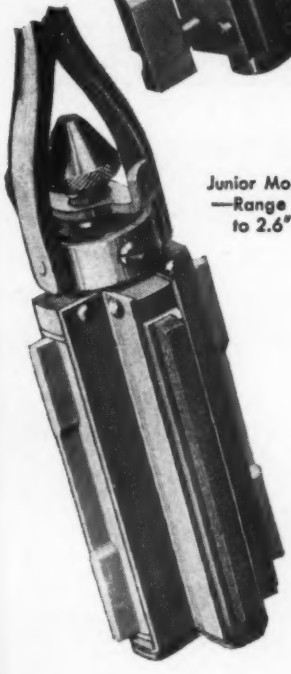

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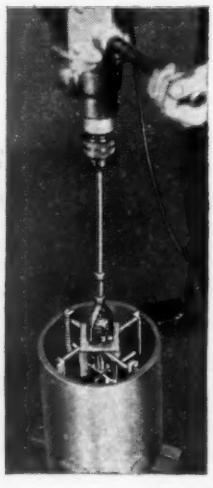

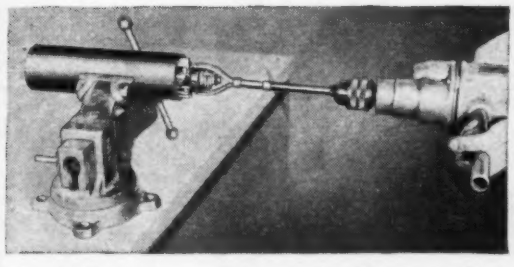

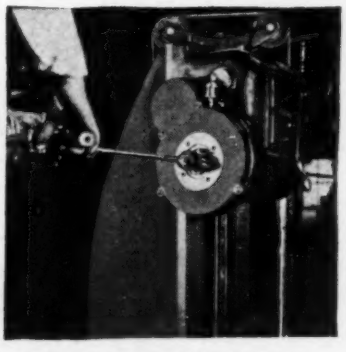

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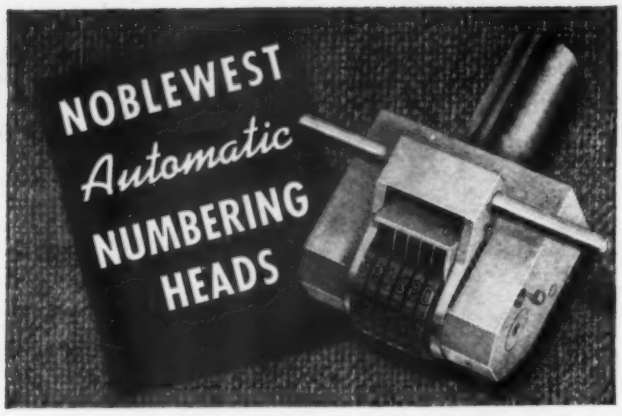

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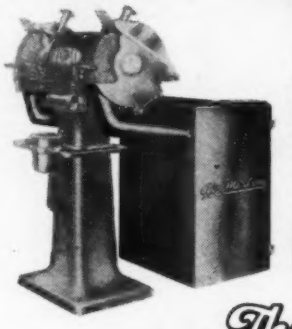

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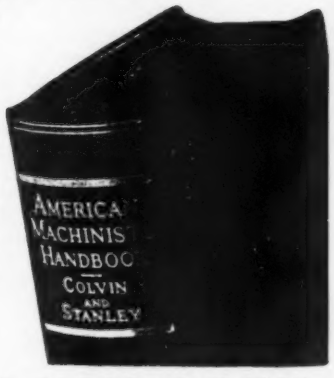

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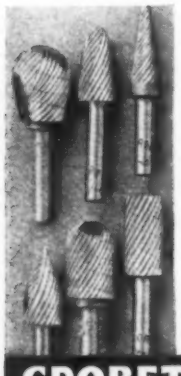

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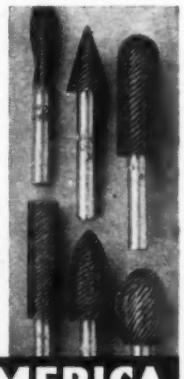

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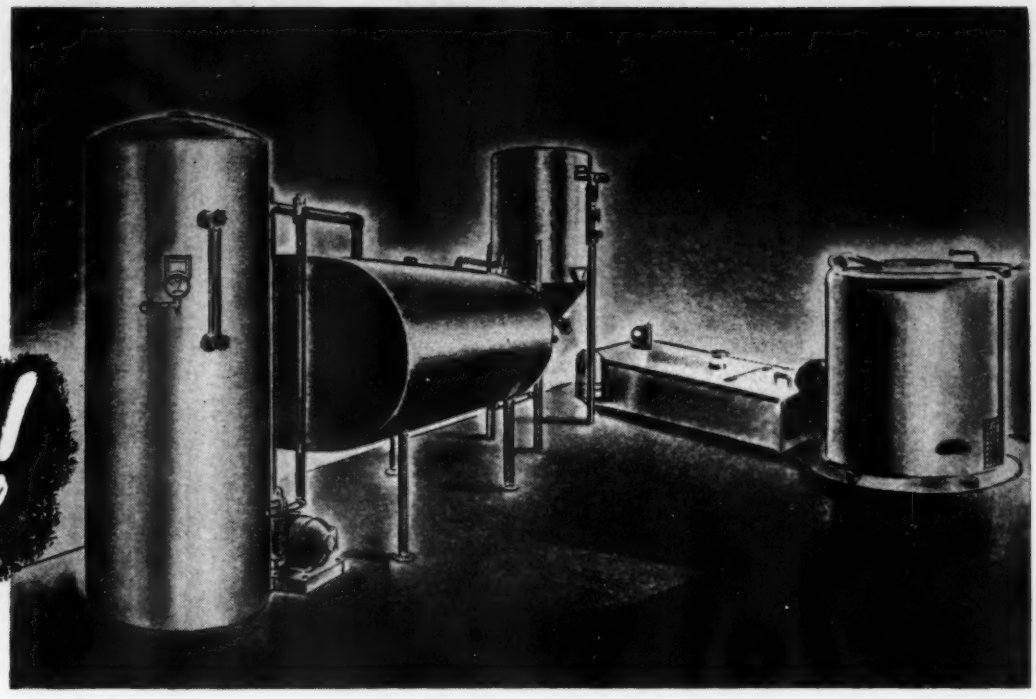

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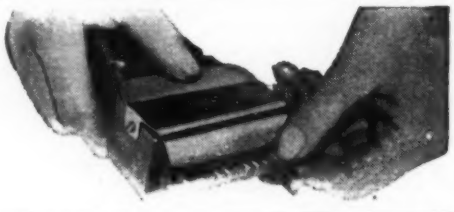

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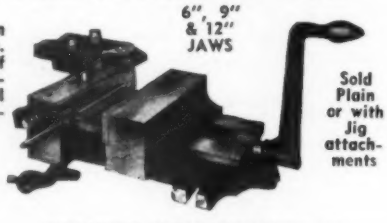

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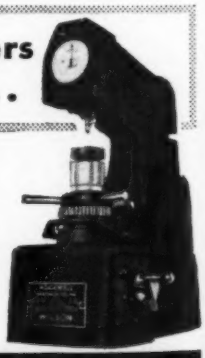

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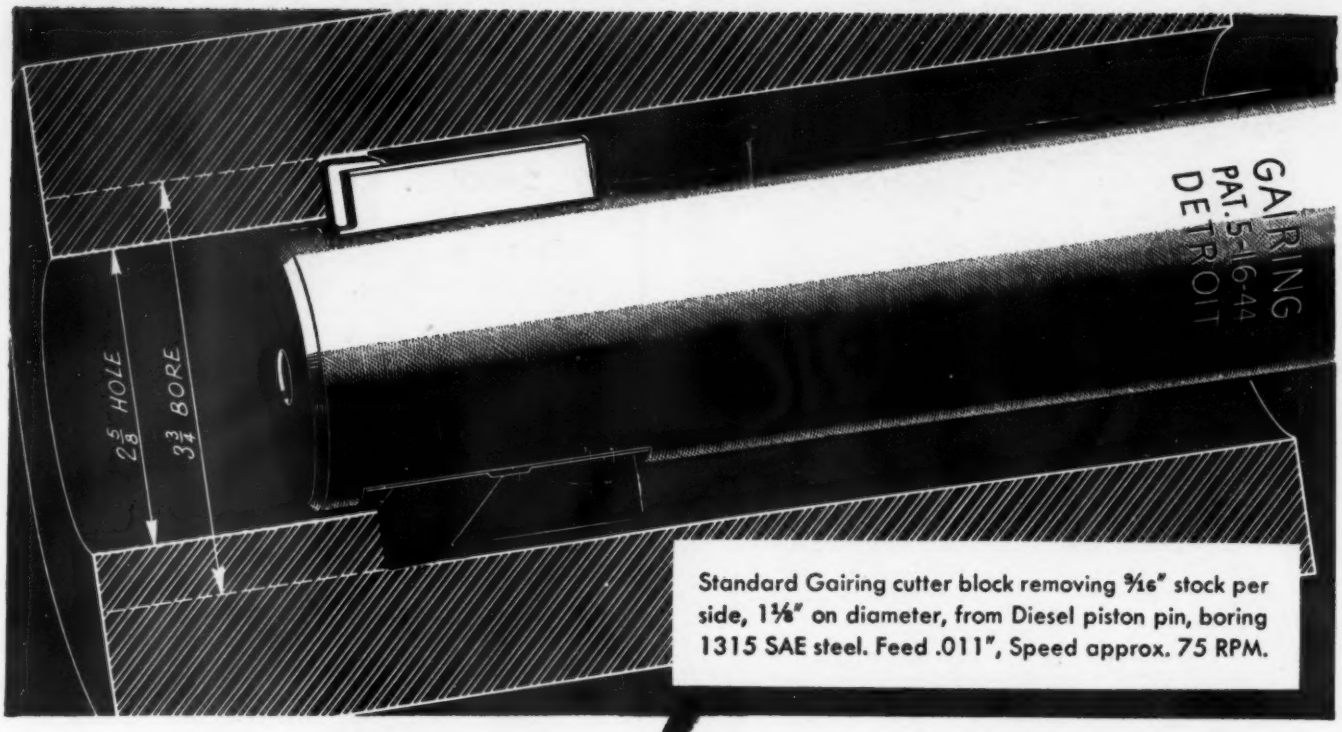

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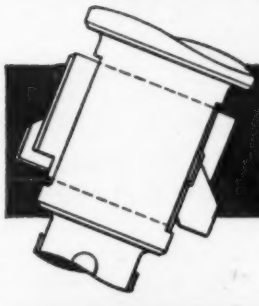
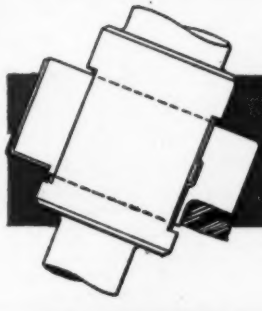
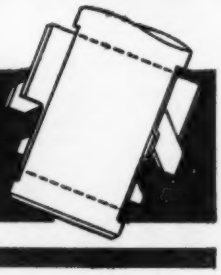


Standard Gairing cutter blocks can be furnished *regular type* for boring and *floating type* for finishing cuts.

Standard Gairing micrometer blocks have one blade, are quickly adjustable to within .001 in. diameter.



Special solid type blocks of high speed steel or tipped with hard alloy are designed for roughing or facing.



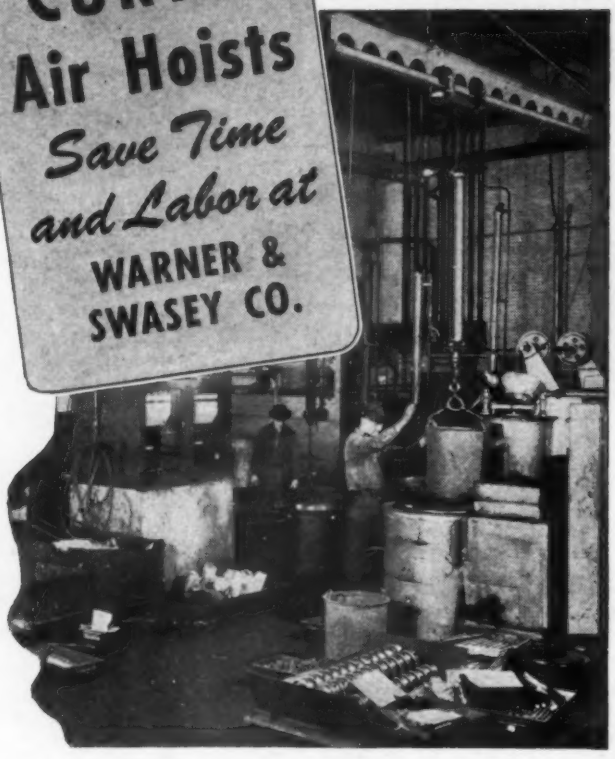
Special blocks are designed for multi-diameter work, combined boring, chamfering, counterboring, facing.

30th

GAIRING TOOLS

THE GAIRING TOOL COMPANY, Detroit 32, Michigan

CURTIS Air Hoists *Save Time and Labor at* WARNER & SWASEY CO.



Curtis Air Hoist used in operating the Cleveland Tramrail System in the heat-treating department of Warner & Swasey Co., Cleveland.

It's another example of a well-known company relying on Curtis air-operated equipment to speed production, save time and labor, too. Curtis Air Hoists offer the following advantages to any company concerned with any lifting, pushing or pulling operation:

- **Low first cost—lowest operating expense.**
- **Smooth, fast, accurate control of load.**
- **One-man or one-woman operated.**
- **Finger-tip control.**
- **Light weight—pendant, bracketed or rope-compounded types.**
- **Cannot be overloaded.**
- **Capacities up to 10 tons.**

92 Years of Successful Manufacturing

Find out how Curtis Air Hoists, Air Cylinders and Air Compressors can save man hours, cut costs in your plant. Write for bulletin C-7.

JH-490

CURTIS PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1924 Kienlen Avenue, St. Louis 20, Missouri

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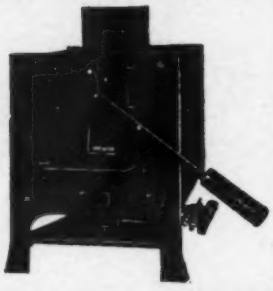
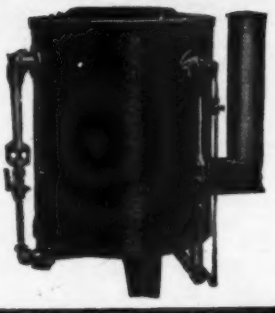
"BUZZER" HIGH SPEED *Gas* FURNACES

2400° F.
attained quickly with "BUZZER" High Speed Full Muffle Furnaces.

Designed primarily for high carbon and alloy steels.



NO BLOWER or POWER NECESSARY
. . . Just connect to gas supply



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Used for Salt, Cyanide and Lead Hardening. Also adapted for Melting Aluminum.

Send for the complete "BUZZER" catalog today.

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The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

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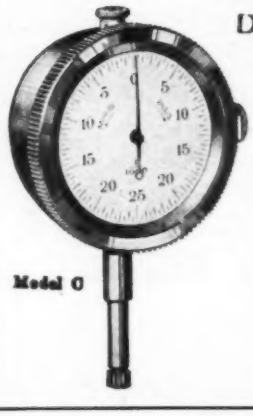
RANDALL and STICKNEY
Dial Gauges and Indicators



are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2½ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .0005 in. or .01 mm. Has a ½-in. range movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units, so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

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Waltham 54, Mass., U. S. A.
Makers of Dial Gauges Since 1885

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48″ x 72″ TUMBLAST
40 to 45 Tons Steel Castings Cleaned in 8 hours

Crucible Steel Castings Co., Milwaukee, Wis., uses two 48″ x 72″ Wheelabrator Tumblasts, each of which cleans 40 to 45 tons of castings daily. One machine cleans green castings, the other annealed castings.

No. 3 MULTI-TABLE
6 Airplane Engine Heads Cleaned in 3 min.

This No. 3 Wheelabrator Table is used in the plant of a prominent aircraft engine builder.

SWING TABLE
330 lb. Furnace Casting cleaned in 4 min.

4 hours were formerly required to tumble 3 of these castings at Premier Furnace Co., Dowagiac, Mich. (Note the small castings being cleaned with the large one.)

WHEELABRATOR AIRLESS BLAST CLEANING

Whenever you see the Wheelabrator at work you will marvel at the mountainous pay loads it turns out with perfect ease and dispatch. And if you will check into cleaning cost records you will find even more to excite your enthusiasm.

But let us suggest that you go a step further and ask for a demonstration of the Wheelabrator on your own work . . . the tangible proof of its value to you in better cleaning, time and cost saved, and other factors may amaze you even more.

Arrangements for such a test can be made at your convenience and without the slightest obligation. Write, wire, or phone us today.

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50% Cost Saving

These 120 lb. railroad castings are cleaned in a Wheelabrator Special Cabinet. Previous cleaning cost was 17.1¢ each. Present Wheelabrating cost is 8.4¢ each.

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WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

Here's why—

GRID UNIT HEATERS WILL LAST AS LONG AS THE PIPES FURNISHING STEAM TO THEM ----

HIGH TEST CAST IRON HEATING SECTIONS

- One piece construction heating sections (patented) of high test cast iron that withstand steam pressures up to 250 lbs.
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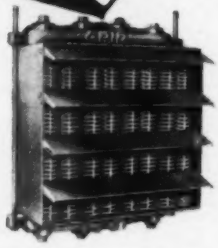
It's the material that makes the difference. GRID High Test Cast Iron Unit Heaters are built to last for years—to last as long as the pipes furnishing steam to them. In many plant installations they have been operating for 16 years without maintenance. Complete details upon request.



SEND *for free booklet "Corrosion in Unit Heaters"*

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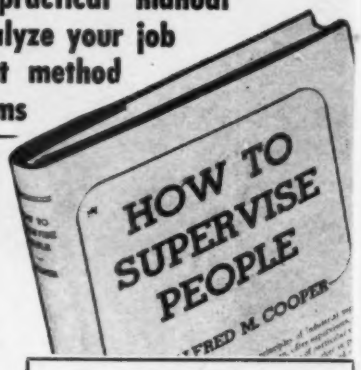
Supervisory methods that win Results

—Let this concise, practical manual show you how to analyze your job and apply the correct method to supervisory problems



This valuable little book explains clearly to executives, superintendents, and foremen the policies and practices for managing people which will win results all along the line. It is built on methods that have actually proved successful. It covers all the problems which occur daily —hiring, reprimanding, firing, getting cooperation, delegating authority, training workers, with the specific solutions that will show you results the first day you use the manual.

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162 pages, 5x7½, only $2.00

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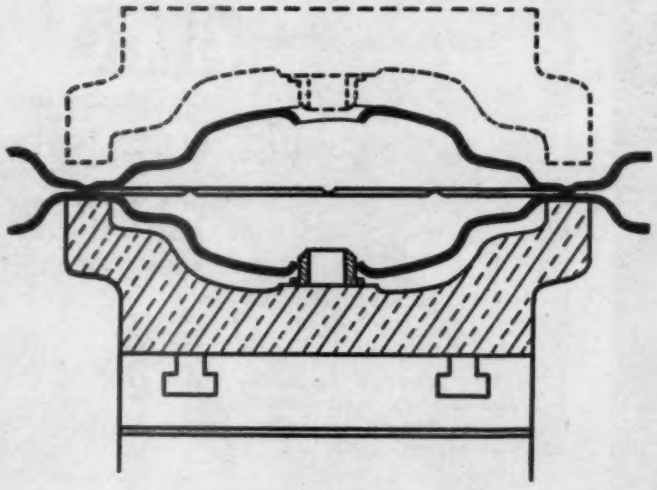

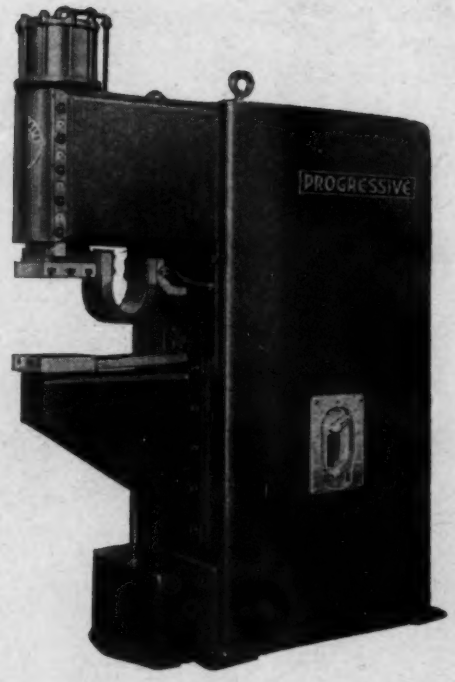

We cut 75% off his fabricating cost

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Top, left... Simple ring dies are used on a Standard Progressive Projection Welder (Top, right) for fabricating steel wheels, out of two identical stampings, each with 4 projections. 8 welds are made simultaneously.

A manufacturer in Illinois was setting up to fabricate a line of toy wagons as a post-war product. He figured they could save money by making each wheel out of two identical stampings spot welded together in 8 places just below the rim.

He was right that spot welding *would* save him money and make a stronger wheel—but he did not know how much MORE he could save by a small change in the stampings.

When Progressive's engineers looked over the design they recommended that each wheel-half be provided with 4 small projections (formed during stamping—see sketch). The two halves could then be dropped into a simple fixture on a standard PROGRESSIVE PROJECTION WELDER—with the projections on one stamping half-way between the projections on the other. With this design, all eight "spots" are projection-welded simultaneously.

This simple design change cut welding and handling time down from over 11 to only 3 seconds per wheel. Desired output of 1200 wheels per hour could now be obtained with one man and one Projection Welder instead of 4 men operating 4 Rocker-Arm Spot Welders.

PROGRESSIVE engineers will be glad to save you money, too, by studying your design for lower cost resistance-welding.

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Instruments for
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CRITERION *Boring* HEADS

Where high precision is required Criterion Boring Heads are of value. Made by precision methods, they are obviously perfect for precision work. Lead Screw is ground from solid AFTER hardening. Large graduated dial. Criterion Heads are sold from coast to coast. Order from your dealer. Request free literature.

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		Full mm.	1/10 mm.

Also AMIC Precision Vernier Calipers, Height Gages, Depth Gages, Pocket Calipers, Comparators, Precision Graduated Metal Scales.
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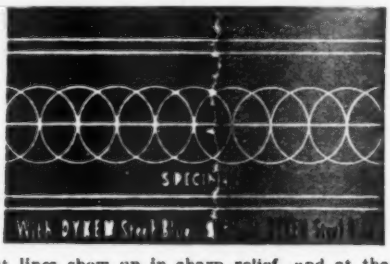
DYKEM STEEL BLUE

STOPS LOSSES
making dies & templates



simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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Consistent Quality

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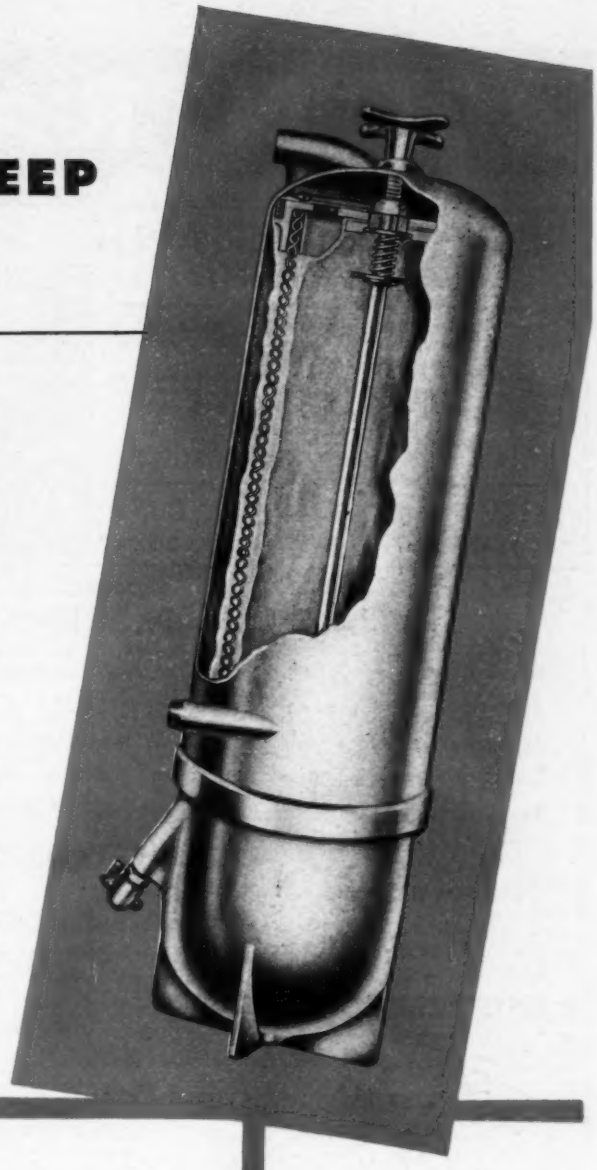
THE *NEW*, EASY, LOW-COST WAY TO KEEP COOLANT *CLEAN*



Now you can put a coolant filter on each grinding machine . . . and gain the advantage of *flexibility* . . . at an average cost of only a few cents a week.

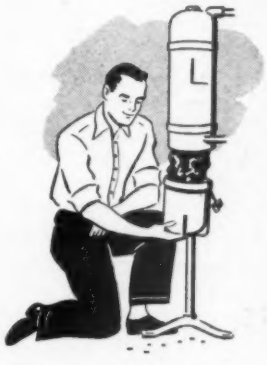
Cuno's new COOLANT-KLEAN is priced less than any comparable filter. The element needs replacement less often . . . new bags are inexpensive . . . coolant stays cleaner longer. Construction is simple and compact.

Typical reports from users say . . . *more dirt collected . . . up to 6 weeks without replacing element . . . "pick-ups" eliminated . . . bags replaced in less than 5 minutes.* (The illustrations show how easy it is to replace the bag.)

COOLANT-KLEAN can be used on any grinder and almost any other machine using coolant or cutting oil . . . is installed quickly, without extra pump, electrical work, plumbing or by-pass. Handles full flow. No filter aid needed. No pre-coating.

Now that unit filtration no longer means high cost, large size and expensive maintenance . . . adopt this more efficient method of cleaning coolant. Send the coupon for COOLANT-KLEAN bulletin.

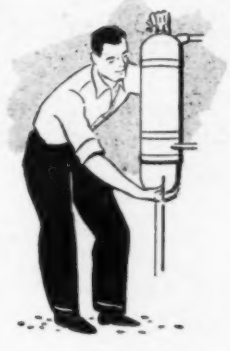
The Easiest Way to Clean a Filter



Single screw clamp at top loosens sump

Grit emptied from sump

New bag easily slipped over spacer screen



Sump replaced

KEEP FLOW ON "GO" WITH

CUNO

ENGINEERED FILTRATION

Free Bulletin on "Finer Finishes at Less Cost"

CUNO ENGINEERING CORPORATION, 244 South Vine St., Meriden, Connecticut

Gentlemen: Send Bulletin on new COOLANT-KLEAN filter to

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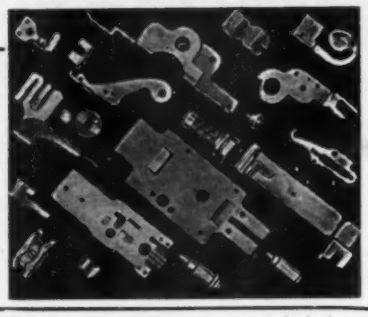
STAMPINGS AND ASSEMBLIES
IN ALL KINDS OF METALS



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Quality work by skilled mechanics is assured. Send your blueprints or samples today.

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Machinery manufacturing concern with extensive experience desires a product to manufacture on a contract basis or straight contract work.

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Equipped for secondary operations: Thread rolling and chasing, centerless grinding, slotting, drilling, heat treating, and plating.

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200-Ton Capacity for hobbing mold cavities. Embossing, etc, also fast delivery on presses to your specifications.
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ON A CONTRACT BASIS

Machine shop with foundry, or good foundry connections to manufacture 6 x 18 and 8 x 24 SURFACE GRINDERS. Must be capable of producing 50 or more grinders monthly. We have jigs, fixtures and patterns. Sample machine available. Sales will average *million dollars* yearly.

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PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us — we will take care of them.
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These advertisers invite you to consider their facilities, when placing contracts for work they are especially equipped to do. If you respond to their advertising, please tell them you saw it in

AMERICAN MACHINIST

HONE INTERNAL DIAMETERS
ELIMINATE COSTLY GRINDING, REAMING, LAPPING

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Send blueprints for quotations

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NEW ADVERTISEMENTS received by 10 A. M. September 11th will appear in the issue of September 26th subject to limitation of space available

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FIRST CLASS JOBBING shop tool and die-maker superintendent. One who is accustomed to very high precision work. To such a person we can offer a very good position both in conditions and financially. Shop located south central part of New York State. Age and experience must be given in order to receive consideration. No college graduate need apply. P-754, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED: SALES Administrator to serve as executive in management of internal operation of sales dept. of Corportion engaged in manufacture of medium and heavy machinery; to supervise program with outside offices, jobbers and dealers in price estimating and quotations. Engineering background preferred. Will have general administration of sales dept. in capacity of asst. to general sales manager. P-755, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED: COST Estimator and pricer of heavy and medium weight machinery, capable of calculating costs and setting up cost controls. Must have thorough knowledge of machine and work operations in machine and assembly shops. Engineering knowledge and experience preferred. Executive ability required with capacity to cooperate with sales, engineering and manufacturing departments. Will head cost estimating and pricing department. Submit details of past experience. P-756, American Machinist, 330 W. 42nd St., New York 18, N. Y.

FIRST CLASS Mechanic Wanted: to take charge of metal furniture plant. Willing to go South. Must be thoroughly familiar with laying out dies. Give experience, salary, etc. P-760, American Machinist, 330 W. 42nd St., New York 18, N. Y.

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SALES EXECUTIVE: qualified by college technical education and actual machine shop experience. Desires position as sales manager or sales engineer with progressive firm. Excellent background as sales manager developing and organizing manufacturers agents and dealers on a national basis. Tools and gages preferred. Will consider other lines. Current salary $5500.00, age 35, married. PW-745, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 344)

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SUPERINTENDENT OF MAINTAINENCE, around $10,000, age 45 to 50, M.E. Graduate, to take full charge mechanical and electrical departments totaling 3,000 employees in heavy industry. Above average executive type with several years maintainence experience. Excellent.

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WANTED
MECHANICAL ENGINEER

Must be thoroughly experienced in all gear manufacturing problems as well as designing; only those with extensive gear experience need apply. Exceptional opportunity. Write full history including name of university and year graduated; names and addresses of all former employers; age; salary desired.

P-581, American Machinist
330 W. 42nd St., New York 18, N. Y.

MECHANICAL DRAFTSMEN AND DESIGNERS

Excellent opportunities for men experienced in heavy machinery, plant layouts, foundations, industrial furnaces, piping or similar work.

Apply
Employment Office
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

WANTED
SALES ENGINEERS

To represent a modern gear manufacturing plant. Must have a degree in mechanical engineering as well as extensive selling experience in the gear industry. Write full details including name of university and year graduated; names and addresses of former employers; salary and territory desired and other pertinent details.

SW-609, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED
MECHANICAL ENGINEER

Must have intensive experience in the designing and production of screw pumps. Write names and addresse of all former employer; age; salary desired.

P-611, American Machinist
330 W. 42nd St., New York 18, N. Y.

SUPERINTENDENT

DIE AND TOOL SHOP—$6,000 plus bonus. To take complete charge of rapidly growing die and tool shop in Pittsburgh area. Must be experienced in estimating jobs and supervising manufacture of the following dies: Die casting, plastic, permanent mold, forging, sheet metal blanking, and forming. Experience in manufacture of special cutting tools desirable but not necessary. Employer will pay placement fee.

"EXECUTIVES EXCLUSIVELY"
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Club Floor Suite
Hotel William Penn. Pittsburgh, Pa.

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SW-712, AMERICAN MACHINIST
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MANUFACTURERS AGENT

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PHILADELPHIA & VICINITY

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BO-750, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

(Continued from page 343)

MACHINE SHOP Superintendent: Foreman, 10 years as shop supervisor practical experience machine tools, planning production, labor relations, job shop work, maintenance work, tool, die, fixture. East or South states preferred. First class reference. PW-746, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SALES ENGINEER: High type executive, age 30, M.I.T., 10 years industrial plant experience as machinist, tool designer, and shop supt. Desires lucrative connection in New York N.E. area with manufacturer or distributor. PW-757, American Machinist, 330 W. 42nd St., New York 18, N. Y.

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SELLING OPPORTUNITIES WANTED

WANTED BY manufacturers agent: Chicago sales territory, Mechanical Specialties or Tools selling to machinery manufacturers and machine shops. Include full particulars. RA-738, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

REPRESENTATION OR Sales follow-up for out-of-town manufacturers of machinery, small tools and gages, parts, apparatus and equipment in New York City area solicited by an engineering firm capable of providing installation, engineering and specialized personnel necessary. All inquiries welcome. RA-747, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ESTABLISHED SALES Engineer: and mechanical engineer desire lines in Northwestern Ohio. Machine tools and allied products, requiring technical representation and having established accounts in this area preferred. RA-759, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

ESTABLISHED IMPORT & export firm located in Shanghai, China desires additional connection with leading manufacturers. References furnished. Address: Ray Snyder, c/o Dean Company, 26 O'Farrell Street, San Francisco 8, California.

PATENT ATTORNEY

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PW-751, AMERICAN MACHINIST
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WANTED!
SURPLUS MACHINERY
WE BUY AUTOMATIC
SCREW MACHINES
Lathes, Planers, Shapers,
Millers, etc.

Before buying, selling or trading see

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Late Models

2—#50 Waterbury Farrel Thread Rollers
1—1½" National Upsetter
1—Zeh-Hahneman #12 or #16 Percussion Press

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WANTED

2—Bliss No. 16 Horning Presses
2—Bliss No. 5 Spinning Lathes
1—Toledo No. 43 Horning Press
1—No. 22 Consolidated Press
or suitable substitutes

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WANTED TO BUY

Several multiple spindle drill presses with a #2 Morse Taper. Can use 3-, 4-, or 6-spindle and require a total of 25 spindles.

Columbus Production Mfg. Co.
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WANTED
MACHINE TOOLS

Not more than five years old

KEARNEY & TRECKER #4 Vertical Miller
VAN NORMAN #36 Universal Miller
ACME-GRIDLEY 9/16 to 2"—6 spindle Model RA Auto.
CINCINNATI 3' 9" Radial Drill.

Give details and price

W-753, AMERICAN MACHINIST
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Power Shear, 3/16" capacity 8' to 10' long.
Power Box Brake, 10 Ga. Capacity, 5' to 6' long.
Power Punch Press, 4 holes 7/16" Dia. thru 10 Ga. at 4" centers.

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Kalamazoo 24F Mich.

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2—#00 Brown & Sharpe Full Automatic, Standard Speed
1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.
1—#515 National Acme 1⅛" 4-spindle Automatics, complete
2—3¾" Cleveland Model A.
1—#1 Brown & Sharpe Standard Speed, Belt Drive, Full Automatic (same size as #2).
1—#2G Brown & Sharpe Full Automatic, serial #5396.

LATHES

Logan Q.C.G. Lathes (new).
Sebastian Engine Lathes (new).
14" x 20' Hendey Toolmakers Lathe.
16" x 6' American Motor Driven Lathe.
16" x 8' Lodge & Shipley 12-speed Grd. Hd.
18" x 10' American, Geared Head, Taper.
20" x 10' Hendey with Taper.
20" x 10' American, Motorized. Q.C.G.
24" x 20' American, Motor drive.
48" x 30' Simmons Geared Head, 1941.

TURRET LATHES

4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive.
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven.
16" Warner & Swasey Brass Lathe.
#2A Warner & Swasey Universal.
#6A Potter & Johnson Automatic Chuckers.
#3R Gisholt Universal like new.
#4 Foster GFH Hand Turret Lathe.
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)

PLANERS

20" x 20" x 24" N.-B.-P., Planer Shaper.
26" x 26" x 8' Gray Planer, 2 heads.

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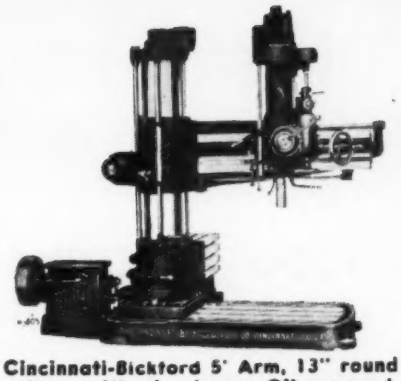
Lennox Splitting Shear ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Gould & Eberhardt Slitting Shear, 10 ga.
Bertsch 3" x 36" Geared Slip Roll Former.
Niagara 48" Roller Leveller, 6 Rolls.
Niagara 36" Power Folder, 20 Gage.

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
#1-#1½-#2 Brown & Sharpe Plain Miller.
P & W 2½" Duplex Spline Miller.
Thread Miller, Hall Planetary #1—24".
#8 Lees Bradner Thread Miller.
#1, #2 Kempsmith Plain Millers.
#3B Hendey Universal Miller, motor drive.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

#4 Cincinnati Vertical High Power Miller. (2)

#16 Blanchard Surface Grinder, 30" dia., magnetic chuck, 25 h.p. motor on spindle.
2—#2 Cincinnati Centerless Grinder.
Pratt & Whitney Vertical Surface Grinder, 14" x 36" with 10" x 36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.
#2 Cincinnati Universal Tool and Cutter.

RADIAL DRILLS

4' Arm, 11" Column Cincinnati-Bickford.
5' Arm, 13" Column Cincinnati-Bickford.
5' Arm, 14" Column Fosdick, motor drive.
6' Arm, 15" Column Cincinnati-Bickford.
3½', 10" Col., Cincinnati-Bickford AC Motor Drive, Gear Box.

GRINDERS

Queen City Dble. End Grinders, motor driven (new).
#33 Abrasive Vertical Surface.
#3 Abrasive Horizontal Surface.
12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" deep.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder.
10" x 18" Norton Cylindrical.
2—Cincinnati, #1½ Tool & Cutter Grinders.

BORING MILLS

100" Niles-Bement-Pond, 2-head geared motor drive.
72" Cincinnati Heavy Pattern Vertical Boring and Turning Mill.
3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle, #2 M. T.
Fosdick 13" Super speed 4-spindle drills.
Natco #12, 12 spindle #1 M. T.
2—Natco #14, 22 spindle Rectangular head Drilling Machine, #2 M. T.

POWER PRESS HEADQUARTERS

Famco Arbor & Foot Presses (new).
#4 Bliss D. C. Forging Press.
200 ton A.C.F. Hydraulic Press. Bed 24" x 36", 4-post.
75 ton H.P.M. 2 post, Hydraulic Press.
Hilles & Jones #5 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. ARR, motor drive, 54" throat.

SHAPERS & GEAR CUTTERS

1—24" Gould & Eberhardt Backgeared Crank Shaper, M.D.
#1 Adams Gear Hobbers, Belt driven (3).
24" American Direct Motor Drive.
15" Potter & Johnson, Universal Knee.
16" Gould & Eberhardt, Direct Motor drive.
Slotter 12" stroke New Haven, motor drive.
Rhodes 7" stroke, Shaper.

MISCELLANEOUS

1—Pease Peerless Model 20 Blue Printing Machine. For paper 42" wide. Equipped with 5 arch lamps, 2 tanks, 1 gas heated dryer with automatic band control #6505 A. Size A.
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Thomson Cutter and Creaser, 12½ x 18½.
Heat Treating Furnaces for the tool room.
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Schuster Wire Straightener & Cut Off, capacity ½" dia. up to 40' long.
Pels Hand Operated Universal Iron Worker capacity 2" x 2" x 3/16 angle; 1" round bar stock, punch ½" hole thru ½" plate. Armor plate construction.....$350.00

120" x 96" x 24' **Simmons Heavy Duty Double Housing Planer.** Complete with 4 heads and standard equipment, arranged for reversing motor drive and rapid traverse and including one Reliance 50 HP, 150/900 RPM D.C. motor, frame P-4617, 230 volts serial #644739, one Cutler Hammer control Box #B-871007A7.

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CLEVELAND 7/8" to 2 1/2" Model A
CONOMATIC 3 1/2"—4 spindle—latest type
NEW BRITAIN-GRIDLEY No. 65; 6 spdle; chucking; latest type

● BORING MILLS—Horizontal

CINCINNATI-GILBERT 3 1/2" bar; floor type, latest type
FRANKLIN 4 1/2" bar—SPD
GIDDINGS & LEWIS #25T 2 1/2" bar, latest type
LUCAS No. 31—3" Bar—motor drive
NILES BEMENT POND 5 1/2" Bar
NILES BEMENT POND 4 1/2" bar—floor type
NILES BEMENT POND 5" bar—floor type
NILES BEMENT POND 7" bar—floor type
NILES BEMENT POND 6" bar—floor type
OHIO #5F-420 floor type, Timken bearing, 5" bar, latest type
PEDRICK 3 3/4" bar—floor type
P & H #10—3 1/2" bar floor type
PEDRICK 3 1/2" bar floor type, M.D.

● BORING MILLS—Vertical

BAUSCH #2, #3, multpl. spindle, latest type
BETTS 120"—2-swivel heads, motor drive
BULLARD 24", 36", 42" New Era Type, M.D.
BULLARD 86"—2-swivel heads; motor drive
COLBURN 72" 2-swivel heads AC M.D.
EDLUND #1B ss, M.D.
EDLUND #2MS, 2 spindle, M.D.
KING 72" 3 heads, latest type, AC M.D.
KING 62" 2-swivel heads AC M.D., PRT
NILES 72" 2 swivel heads D.C. M.D.
NILES BEMENT POND 84" 2-swvl. hds; M.D.
NILES 42", 2-swivel heads, PRT
NILES BEMENT POND 100" 2-swivel hds. PRT

● DRILLS

ALLEN #2, 2-4 spindles—latest type
AVEY No. 2—1 to 6 spindles
BAKER #121 Single spindle—latest type
BODINE No. 42-20 Auto.
BUFFALO #16—4 spindle—latest type
FOOTEBURTE SIPP #2, #3—ss—latest type
HENRY & WRIGHT—2-spindle
NATCO C-13H multiple spindle
PRATT & WHITNEY No. 1/2B x 50"—2-spindle deep hole—latest type

● DRILLS—Radial

AMERICAN 3' 11", 4' 11", 5' 11"—latest type
AMERICAN 4' 11", 5' 13" triple purpose, M.D.
AMERICAN 5' 13" Universal—M.D.
CANEDY-OTTO 3' 11" new
CARLTON 4' 13", 5' 14", 7' 15", M.D.
CARLTON 3' 11", 6' 17", 6' 19", 7' 19" latest type, M.D.
CINCINNATI BICKFORD 6' 15", 6' 19", superservice, latest type
CINCINNATI BICKFORD 4' 11" Plain, M.D.
WESTERN 4' 18", 5' 18", 6' 20"—latest type

● GEAR CUTTING EQUIPMENT

BARBER COLMAN No. 3 Gear Hobber
BROWN & SHARPE No. 13 Gear Cutter
BROWN & SHARPE No. 6 x 60 Gear Cutter
BROWN & SHARPE #44 Gear Hobber
CINCINNATI Gear Burnisher
FELLOWS #7, #7A, #72, #77, gear shaper
FELLOWS #64A, 624A, gear shaper, latest type
GLEASON 18" bevel gear generator
GLEASON bevel gear tester and lapper
GLEASON #13 tester
GLEASON 24" Bevel Gear Planer
G & E 12H Gear Hobber Motor drive
GOULD & EBERHARDT 24H Uni. gear hobber
G & E #36B Gear Cutter; spur—Bevel—m.d.
G & E #96H Gear Hobber, with differential
MICHIGAN #854 Gear Finisher, latest type

● GRINDERS—Cylindrical Plain and Universal

BROWN & SHARPE #1, #4 Uni. latest type
BROWN & SHARPE #3 Univ. M.D.
BROWN & SHARPE #5 Plain, M.D., latest type
CINCINNATI 12x48 Uni. hyd. latest type
CINCINNATI 16 x 48 pl. M.D.
LANDIS 6x18 Plain, M.D.
LANDIS 10x24 Type C Uni. hyd. latest type
NORTON 12 x 24 type LC, multi-purpose, uni., M.D.

● GRINDERS—Internal, Cutter and Miscellaneous

BROWN & SHARPE No. 13 Univ. & Tool—latest type
BRYANT No. 16—16" Chuck Internal
CINCINNATI No. 2 Plain Tool & Cutter—latest type
CINCINNATI #2, Centerless, motor driven
FITCHBURG Uni. spline shaft, hyd.
HEALD No. 70—Internal—motor drive
HEALD #72 A3, sizematic internal
HEALD 72A5 pl. internal latest type
HEALD No. 81 Plain Internal—latest type
LEBLOND No. 2 Universal Tool & Cutter; latest type
OLIVER #510 Drill, latest type
OLIVER Univ. and Tool—latest type
PRATT & WHITNEY Contour cutter, latest
SELLERS #4T Uni., tool, latest type

● GRINDERS—Surface

ABRASIVE 1 1/2, latest type
ARTER 8" Rotary Surface
ARTER 30" Rotary Surface—Hyd., latest
ARTER Automatic Piston Ring
BLANCHARD #16A Dial Type, M.D.
BLANCHARD #16—26" Chuck—motor drive
MATTISON 14x16x36" hyd. latest type
MATTISON 20x24x72 hyd. latest type
MATTISON 16 x 24 x 96—Hyd.—latest type
NORTON 10 x 24, hyd., latest type
NORTON 10 x 60—Hydraulic—latest type
THOMPSON 12" x 12" x 24" Type B Hydraulic—latest type
THOMPSON 12" x 16" x 48" Type C Hydraulic—latest type

● LATHES—Engine and Mfg.

AMERICAN 36"x25' centers Timken bearing, 2 carriages, taper attach., latest type
AXELSON 24" x 72" centers—Timken Bearing—latest type
BRADFORD 14" x 42"—Timken Bearing—latest type
BRIDGEFORD 36" x 28"; 36" x 32'; 36" x 35' bed; 2 carriages
BRIDGEFORD 42" x 35' bed—2 car.—M.D.
HARDINGE #TR59, latest type
HENDEY 20x8' bed, yoke hd., M.D., taper att.
HENDEY 12 x 54 Centers, Mfg.—latest type
LEBLOND 16 x 14' bed, rapid prod., Timken Bearing, latest type
LEBLOND 20" x 48—20" x 120 centers—Timken Bearing—latest type rapid production
LEBLOND 13"x4' bed Timken bearing, rapid prod., latest type
LO SWING 4x84, 4x60, 8x84, 8x60 Timken Bearing—latest type
NILES 36" x 25' centers, 2 carriages, PRT; Timken Bearing
NILES 48x55' centers Timken bearing, 2 carriages, taper attach, PRT, latest type
NILES 36x24' centers "Time Saver", Timken Bearing, 2 carriages, taper attach. PRT, latest type

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NILES 60"x10' centers, 60"x15' centers, 60"x35' centers, 60"x40' centers, Timken bearing, one or two carriages, taper attach. PRT, latest type
PITTSBURGH 50" x 30' bed—M.D.
RIVETT Style 918 Bench Type; ball bearing
SIDNEY 17" x 8' bed, cone head, M.D.

● LATHES—Turret

BARDONS & OLIVER No. 3—latest type, Timken Bearing
BARDONS & OLIVER #5, #7 Univ. Timken Bearing; chucking
BROWN & SHARPE #1 Hand Screw machine, Timken bearing, latest type
CINCINNATI ACME #1 Universal—Timken Bearing—latest type
CINCINNATI-ACME 5W, Timken Bearing, latest type, 2" bar cap
GISHOLT #1L, #2L Uni., Timken Bearing, latest type
GISHOLT No. 3, No. 4 Univ. Timken Bearing—latest type
GISHOLT #3D Simplimatics—Timken Bearing—latest type
GISHOLT #4L, 9" hole—cross sliding turret—Timken Bearing, latest type
JONES & LAMSON #3-#5-#7C Univ.; latest type—Timken Bearing
LIBBY #1H—5 Timken Bearing—latest type—5½" hole
MOREY No. 2G, 1" Cap. Timken Bearing
MOREY No. 3 Univ.; 1½" Cap. Timken
MOREY No. 4 Univ.; 2" Cap. Timken Bear.
WARNER & SWASEY No. 3, No. 4, No. 5 Univ. Timken Bearing—latest type
WARNER & SWASEY #3A Universal—M.D.
WARNER & SWASEY #1A, #4A Uni. Timken bearing, latest type

● MILLING MACHINES—Manufacturing

BROWN & SHARPE No. 10, 12 Auto. Timken—latest type
CINCINNATI 4-36 Hydro. Timken Bearing—latest type
CINCINNATI #0—8 Vert., Pl. Auto.—Timken Bearing—latest type Rise & Fall
CINCINNATI No. 1-12, No. 1-18 Plain Automatic Timken Bearing—latest type
INGERSOLL 24 x 24 x 8' Planer type—1 head
INGERSOLL 36 x 48 x 18' Planer type—4 hds.
INGERSOLL 42 x 36 x 16' Planer type—4 hds.
KEARNEY & TRECKER No. 1218 Auto. Timken Bearing—latest type
MOREY No. 12M—2 spindles Profiler and Milling Machine
OHIO Auto. 16" x 72" table—Timken Bearing—latest type 36" longitudinal feed
SUNDSTRAND #33 RIGID MILL DUPLEX—Timken Bearing—latest model
SUNDSTRAND #25 Rigid mill, duplex, Timken bearing, latest type

● MILLING MACHINES—Plain

BROWN & SHARPE #2B, #3B, #4B standard type, Timken Bearing, latest type
BROWN & SHARPE #000—Timken Bearing—latest type
BROWN & SHARPE #0Y M.D.
BROWN & SHARPE #2 light type—latest
CINCINNATI #2, #3 Timken Bearing, dial type, latest type
CINCINNATI #5 High powered, M.D.
KEARNEY & TRECKER No. 2H, No. 2 HL, No. 3H, Timken Bearing—latest type
KEARNEY & TRECKER No. 2K, No. 3K—Timken Bearing—latest type
KEMPSMITH #4 Maxi-miller, Timken Bearing, latest type

● MILLING MACHINES—Universal

ROCKFORD #2B—motorized
VAN NORMAN #26 Ram, latest type

● MILLING MACHINES—Vertical

BROWN & SHARPE #5—motor drive
CINCINNATI No. 2, No. 4, Timken bearing—dial type, latest type
COCHRANE BLY Uni. vert. shaper miller, m.d.
KEARNEY & TRECKER #2H Timken Bearing, latest type
REED PRENTICE No. 3VG—high speed—latest type

● PLANERS

CINCINNATI 24" Crank—motor drive
CINCINNATI 36 x 30 x 5' Box table, PRT, 1 head—motor drive
CINCINNATI 84x72x18' HYPRO, 4 heads vari-voltage, latest type
CINCINNATI 48x48x20' 3 heads, AC, M.D.
CINCINNATI 120 x 96 x 20'—4 heads box Table, PRT—motor drive
CLEVELAND 48 x 48 x 16' Open side, 3 heads, motor drive
DIETRICH & HARVEY 48 x 48 x 16' 4 heads, Hydraulic—motor drive
GRAY 48 x 48 x 16' 4 heads motor drive
HAMILTON 42 x 42 x 20', 4 hds., M.D.
LYND FARQUHAR 26" open side M.D.
NILES BEMENT POND 96 x 80 x 20' box table 4-heads Hyd. PRT. motor drive
NILES 48 x 48 x 12' "Time Saver" 4 heads, P.R.T., box table, D.C., M.D.

● PRESSES

BALDWIN SOUTHWARK 300 ton Vertical Hydraulic. Latest type
BLISS #6 Arbor Press
CLEARING TYPE K-1200-30 Knuckle Joint, 200 Tons—latest type
FERRACUTE DG-55, drawing; latest type
GRENARD #6 Arbor Press
WATSON STILLMAN Hyd. Straightening Press 20 Ton

● SAWS

BRIDGEPORT #48W Abrasive
CAMPBELL #401 Cutamatic Wet Abrasive Cutting Machine
GROB #OS-20 band, latest type
LUCAS #138 Cold Saw, M.D.
MARVEL #9 Hack, 10 x 10, latest type
MOTCH & MERRYWEATHER #3 Cold Saw—Hyd. latest ype
MAQUOKETA 10 x 10 hack, M.D.
PEERLESS 6 x 6 Hack Saw—Auto. Feed—latest type
PEERLESS 14" x 14" Hack—latest type
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JONES 6" Vertical—latest type
LAMAIRE 18" Vertical Hyd., latest type
MOREY 10", 14", Vertical—latest type
PRATT & WHITNEY 6", 10"—Vert.—M.D.
PRATT & WHITNEY 6", 12" Model B—latest
ROCKFORD 16" hor. M.D.

● THREAD MILLING MACHINES

MOREY SHIELDS 12 x 30, 12 x 60, 12 x 120, 12 x 192—latest type
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Cone 8 spindle, 1⅝".
RA-6 Acme Gridley—1".
5½" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
⅞" Cleveland Model M, four spindle.

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42" Barnes, sliding head.
Allen Sensitive Drill, four spindle.
No. 11 Natco Multiple Drill, 16 spindle.
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No. 6, 6I Fellows Gear Shaper, m.d.
No. 5AC Lees Bradner Gear Hobber.
6" Gleason Str. Bevel Gear Generator.

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Nos. 16—20", 16—30" Blanchard Surface.
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10" x 72" Norton Cylindrical Grinder.
No. 13 Brown & Sharpe Universal & Tool Grinder.
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No. 2 Cincinnati Centerless Grinder.
★ No. 3 Cincinnati Centerless, m.d.

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14" x 6' Sebastian, motor in base.
16" x 6' Reed Prentice, g.h., Type AA.
16" x 8' American, g.h.
18" x 10' Hendey, g.h.
24" x 10' American, C.D.
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15" x 30" Lipe Carbo-matic, new in 1943.

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No. 2A Warner & Swasey, Timken Bear.
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No. 1B Foster, g.h.
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No. 3 Warner & Swasey, g.h., new in 1943.
No. 6D Potter & Johnston Automatic Chucking and Turning Machine.

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No. 31 Lucas Horizontal Boring Mill.
No. 26 Van Norman, swivel head, new in 1942.
No. 3B Milwaukee, plain, m.d.
No. 2 Milwaukee Universal.
No. 2H Milwaukee Vert., motor in base.
No. 0-8 Cincinnati Plain Automatic, m.d.
No. 2209 Milwaukee, Table 22" x 158".
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42" Bullard Vertical Boring Mill.

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38" x 38" x 14' Ohio Planer.
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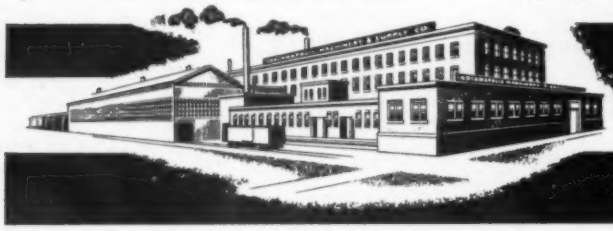

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American 77' Span
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10-TON—Shaw 68' Span
Shaw 73' Span
P & H 78' Span
P & H 87' 6" Span
P & H 80' Span
Northern 71'10½" Span
Northern 60' Span
Morgan 55'6" Span
Morgan 39'5" Span
Morgan 52'3" Span
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Lane 50 Span
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Cleveland 50' Span
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Alliance 58'9" Span
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GLEASON #40 spiral Bevel Gear Planer
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BICKETT 36 x 36 x 12' 3 heads, AC, M.D.
CINCINNATI 36 x 36 x 8' 2 heads box table, AC, M.D.
CINCINNATI 36 x 36 x 10' 2 heads, AC, M.D.
CHANDLER 36 x 36 x 20' 4 heads, AC, M.D.
GRAY 36 x 36 x 10' 2 heads, AC, M.D.
GRAY 36 x 36 x 8' Box table, 2 heads, AC, M.D.
LIBERTY 36 x 36 x 8' 3 heads AC, M.D.
NILES BEMENT POND 36 x 36 x 10', 3 heads, box table, DC, M.D.
OHIO 36 x 36 x 10' 2 heads, AC, M.D.
WOODWARD & POWELL 36 x 36 x 12' 3 heads, DC, M.D.
WOODWARD & POWELL 36 x 36 x 12' 4 heads, AC, M.D.
WOODWARD & POWELL 36 x 36 x 13' 4 heads, AC, M.D.
CINCINNATI 42 x 36 x 12' 2 heads, AC, M.D.
NILES BEMENT POND 42 x 42 x 12' 2 heads, AC, M.D.
OHIO 42 x 42 x 20' 2 heads, AC, M.D.
POND 42 x 42 x 12' 2 heads, AC M.D.
WOODWARD & POWELL 42 x 42 x 10' 3 heads, AC, M.D.
WOODWARD & POWELL 42 x 42 x 10' 4 heads, AC, M.D.
GRAY 44 x 36 x 12' 4 heads, AC, M.D.
BELMAR 48 x 48 x 12' 3 heads, AC, M.D.
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DETRICK & HARVEY 48 x 48 x 12' open side, 3 heads, D.C. M.D.
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HAMILTON 48 x 48 x 16' 4 heads, DC, M.D.
NILES BEMENT POND 48 x 48 x 16' 4 heads AC, M.D.
NILES BEMENT POND 48 x 48 x 16' 2 heads, AC, M.D.
NILES BEMENT POND 48 x 48 x 14' 3 heads, AC, M.D.
PATCH 48 x 48 x 14' 4 heads, DC, M.D.
POND 48 x 48 x 16' 2 heads, AC, M.D.
PUTNAM 48 x 48 x 18' 4 heads, AC, M.D.
GRAY 54 x 42 x 10' 2 heads, AC, M.D.
NILES BEMENT POND 54 x 54 x 12' 2 heads, box table, AC, M.D.
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GRAY 60 x 48 x 16' 3 heads, AC, M.D.
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NILES 18" slotter, DC, M.D.

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P. & W. 14" Vert. B. B.
Excello No. 31 Thread Grinder.
Barber Colman No. 3 Hobbers & Grinder.

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American 16" x 6'—G.H.
American 18"x12'—G.H.
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MILLERS
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B. & S. No. 0Y Production.
Cin. No. 2 Plain; Nos. 3, 4 Vert.
Becker Model C, Vertical.
Becker No. 7H, Plain.
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Lees-Bradner 6"x36" Thread.

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Foster No. 7 and No. 1B.
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96" CINCINNATI, 2-Swivel heads
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12' BETTS Heavy, two swivel heads.
14'-20' NILES-BEMENT-POND Extension type, 2-swivel heads, all geared feeds, table 144" x 12".

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Nos. 2, 3 and 4 CINCINNATI High Power Vertical adjustable head, P.R.T.
No. 5 CINCINNATI Plain Rectangular overarm, table overall 21" x 83".

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42" PUTNAM Car Wheel, M.D.
79" NILES-BEMENT-POND Driving Wheel.
90" Putnam Driving Wheel Lathe, Quartering Attachment, M.D.
48" x 70' N.B.P. Engine Lathe

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72" x 72" x 15' N-B-P Heavy 4 Heads, double deck table. 230 V. DC Reversing.
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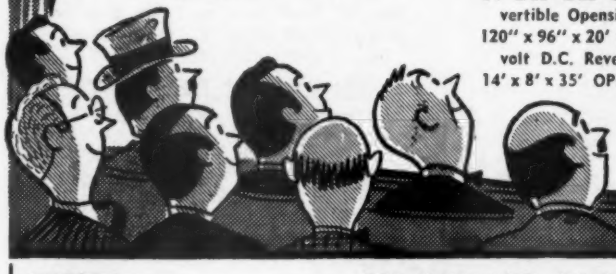
60"- NEWTON Cold Saw, M.D.
26" x 10' Libby Turret Lathe
#55 NEWARK Spur Gear Cutter, M.D.
60" CINCINNATI Spur Gear Cutter
42" PUTNAM Carwheel Borer



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National Bond Shank Nut Tappers—Battery of ⅝" and ⅞" Machines.
2 Landis ¾" Bolt Formers and Threaders, M.D.
1 National ½" to 1" Hot Bolt Head Trimmer
Woodward & Powell 42" x 42" x 36 ft. 4 Head Planer
Cincinnati 36" x 36" x 16 ft. Planer, M.D.
1 Ledge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

National Machinery Exchange
128-138 Mott St., New York 13, N. Y.

FOR SALE

HORIZONTAL BORING MILL

Giddings & Lewis Model 360F. Cap. 72"x72". 6" Bar. Practically New.

WINSTON MACHINERY CO., INC.
517 South Delaware Street
Indianapolis, Ind. FR. 1469

NEW

24" Cincinnati Shapers, M.D.
Abrasive No. 1½ Surface Grinders, M.D.
Racine 6x6" Hacksaws, M.D.
Famco No. 6-C Arbor Presses
Pexto No. 280 Circular Shears

AARON MACHINERY CO., INC.
45 CROSBY STREET NEW YORK, N. Y.

POWER PRESSES

IMMEDIATE DELIVERY — LIKE NEW

MODEL	TONS	STROKE	BED	SHUT	DESCRIPTION
(4) Bliss #1B	43	3-6	14 x 26	8½	Gap, dble. action, dble. roller feed & Cutter
(4) Bliss #4½	75	1½-4½	21 x 26	18	Dble. action, geared, roller feed & cutter
(3) Bliss #6	125	2-5½	24 x 31	14	Dble. action, geared, roller feed & cutter
(3) Bliss #7	180	1½-4½	28 x 36	15	Dble. action geared, roller feed & cutter, air clutch
(1) Toledo #59½ (Bliss #312)	500	8	31 x 31	29	Single action, Dble. geared, twin drive

KINGS COUNTY MACHINERY EXCHANGE

394 ATLANTIC AVE., BROOKLYN 2, N. Y.
Phones: TRiangle 5-5212, 5-5213, 5-5237
WIRE — PHONE — WRITE

MONA MEMBER

IN STOCK

LATHES

8" x 108" Fitchburg Lo-Swing
12" x 18" Lipe Carbo
18" x 6' American Grd. Hd.
20" x 10' Lodge & Shipley Grd. Hd.
36" x 30' Lodge & Shipley Triple Geared Selective Head, two carriages
42" x 18' Putnam Geared Head

MILLING MACHINES

No. 2H Milwaukee Vertical, latest type
#3 Milwaukee Vert. M.D.
#3 B. & S. Plain, M.D.
#3K Milwaukee Vert.
No. 4 Cincinnati Plain, Motor Drive
No. 118 Van Norman Production
24" Cincinnati Production
Taylor & Fenn Spline
Pratt & Whitney Spline
No. 27MB Smalley General Thread Miller
#2 Hanson-Whitney Thread
No. 6 Lees-Bradner Thread Miller
26" x 25" x 12' Ingersoll Adjustable Rail
42" x 36" x 14' Ingersoll Adjustable Rail, four heads

VERT. BOR. MILLS

42" Bullard New Era Vertical Turret
72" Colburn, Motor Drive
72" King Motor Drive

HOR. BOR. MACHINES

No. 50 Universal, 5" Bar, 60" x 144" Table, Maximum Bar to Table 72", Maximum Bar to Outboard 120".
No. 32 Lucas, 3¾" Bar

GEAR HOBBERS

No. 4 Pfauter, 72" Capacity

PLANERS

36" x 36" x 8' Woodward & Powell
60" x 38" x 8' Gray Spiral Geared

TURRET LATHES

#3 W & S. Univ. Bar Feed (1943)
#4 W & S Univ. Speed Selector
#1A W & S Univ. Timken Brgs.
#2A W&S Univ. Cross slid. turret
#4—W & S 1½" Screw Machine
#6—W & S 2" Screw Machine
6.2" Denver Chucking
#6 R Denver Univ. 2-9/16 Cap.
18" Libby—3½" Hole—M.D.
#2 American Brass Lathe M.D.

AUTOMATICS

1⅝" Conomatic, 8 spdl.

GRINDERS

6" x 18" Norton Hydraulic
6" x 30" Norton Hydraulic
#22—12 Heald Rotary
23" x 36" Norton High Swing
10" x 24" Landis Universal Grinder
No. 16 Blanchard Surf.
#2 B & S Surface
Oliver Ace Univ. Tool & Cutter Grinder

HILL-CLARKE

MODERNIZED & MOTORIZED CYLINDRICAL GRINDERS

SIZES AVAILABLE

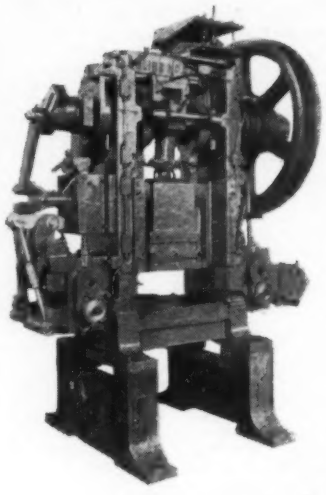
10 x 18	14 x 36	16 x 50
10 x 36	14 x 50	16 x 72
10 x 50	14 x 72	18 x 96
10 x 72	14 x 96	24 x 96
10 x 96	16-24x50 Gap	24 x 240

HILL-CLARKE MACHINERY COMPANY

651 Washington Boulevard
Chicago 6, Illinois

GAUGE YOUR PRODUCTION FOR GREATER PROFITS

Botwinik's stock of Quality Used Machine Tools, like these samples, can fill every one of your requirements!



1—Bliss 4½ Fly Wheel type Tie Rod Frame Press, arr. for V-belt, M.D., blanking stroke 1", draw stroke 3½", outside gate stroke down, adjustment up 10", dbl. roll feed 7" wide, scrap cutter 7" wide, hole in gate R-L 12¼", F-B 8".

1—Bliss 304, M.D., S.S., sin. crank, solid frame Press, stroke 2", fly wheel gear drive.

1—Monarch 22"x22', Mod. M, 16 speed, Helical Grd. Eng. Lathe, M.D., with risers, sw. over bed 30½", dist. betw. cens. 168", AC elect. equip., 11-500 RPM, power rap. trav. to carr., sw. over compound 21", 16 spin. speeds, coolant pump and piping. Brand new. On orig. skids. *Never* used. Built June, 1946.

1—Bridgeford 36"x56', 15 speed, grd. hed., Eng. Lathe, M.D., AC elect. equip., power rap. trav. to carr., compound rest, 2 steady rests, sw. over bed 38", sw. over carr. 26", dist. betw. cens. 48'.

Botwinik Brothers
of Mass. Inc.
3 SHERMAN ST., WORCESTER 1, MASS.

HYDRAULIC FORGING PRESS

Specifications

Maker—Birdsboro
Rated Capacity—1200 Tons
Working pressure of oil, approx.—2000# p.s.i.
Diameter of main ram—39"
Stroke of main ram—18"
Number of pull-backs—2
Stroke of pull-backs—22"
Number of columns—4
Diameter of columns—14½"
Daylight (ram up)—36"
Distance bet. columns—R to L—90"
Distance bet. columns—F to B—28"
Pressing speed (max.)—13" per min.
Pump—Vickers
Motor—75 HP, 220/60/3

This press is also equipped with one spring suspended ball transfer table and one pair of approach tables.

IMMEDIATE DELIVERY
INSPECT IT NOW

J. LEE HACKETT CO.

1961 E. MILWAUKEE
DETROIT 11, MICHIGAN
TRINITY 2-6442-3-4

UNUSUAL VALUES

Blueprint machines, printer-washer-dryer
Rivett Ball Brg. Precision Screw-Machine
Simmons No. 1A Micro Milling Machine
Drills, high speed single & multiple spindle
Drill, 21" Royersford Bk. Grd. Pr. Feed, New
Drills, sensitive, 2 and 4 Spindle
Drill, #25 Foot-Burt, motor driven
Drills—New— 18" Royal Motor driven (10)
Gear cuter, Brown & Sharpe #3—26
Gear cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
22" Buffalo Pr. Fd. Motor Drive, New
16"x6' Hendey Lathe, Quick Change Gear
Magic Chucks, #1-2 & 3 and Collets
Pipe Machine, 3" Oster motor drive
Planer 24"x24"x6' Pease, motor drive
Pnunch & Shear, two ½" & ⅝" capacity
Shaper, 24" Gould & Eberhardt
Turret Lathe, 2" Acme & Warner & Swasey
Welders—Arc & Spot in Stock—New

Outfit: about 27 fine machine tools, drills, lathes, and 5 milling machines, plain and Uni. Tell us definitely what you want as our list is incomplete and only partial.

The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

FOR SALE

GEAR CUTTING EQUIPMENT

5—#7 Fellows High Speed Gear Shapers—$400.00 Each.

3—#6 Fellows Gear Shapers. $500.00 Each.

WINSTON MACHINERY CO., INC.
517 South Delaware Street
Indianapolis, Ind. FR. 1469

No. 4 Fellows Gear Finishers
No. 375 Gibbs Swiss Automatics
Landis 4" x 18" Hydraulic Plain Grinders
Landis 6" x 30" Hydraulic Plain Grinders

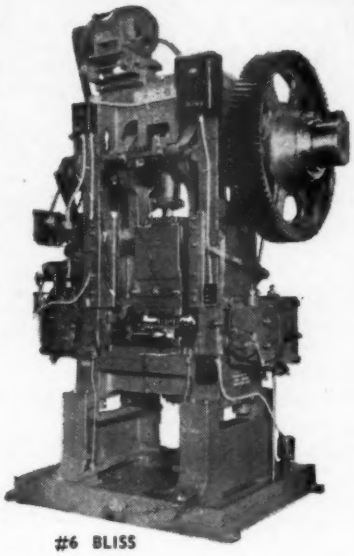
MONA MEMBER

D. E. DONY MACHINERY CO.

47 Laurelton Road, Rochester 9, N.Y.

5" AJAX UPSETTER, M. D.

AARON MACHINERY CO., INC.
45 Crosby Street New York, N. Y.



#6 BLISS

TREMENDOUS STOCK AT REDUCED PRICES

#87½, #88, #78½, #6 and many other Bliss Presses
Steam Hammers from 100 lbs. to 35,000 lbs. Erie, Chambersburg, Niles, etc.

LATHES

60" & 38" swing x 23' McCabe Double Spindle, M.D.
60" x 32', 36" x 14', 36 x 12', 28" x 17' Niles-Bement-Pond, G.H., 2 C M.D.
50" x 26' Johnson, G.H. M.D.
48" x 24' Blocked to 80" Fifield, D.B.G.
16" x 6', 18" x 8' Monarch, Late Type, M.D.
Many others from 7' to 98' swing. Niles, Lodge & Shipley, American, Monarch, Hendey, LeBlond, South Bend, Logan, etc.

TURRET LATHES

#5 Midland, M.D.
#4 Gisholt, M.D.
#2, #3, #4, #5, #1A, #2A, #3A, Warner & Swasey
#1, #2 Foster
Many others from 5/8" to 6" capacity.

PLANERS

60" x 60" x 12' Pond, 4 heads, M.D.
48" x 48 x 10' Cincinnati, 4 heads, M.D.
36" x 36" x 12' Niles-Bement-Pond, 2 heads, M.D.
42" x 42" x 12' Pond, 4 heads, M.D.
36" x 36" x 8' Powell, 2 heads, M.D.
120" x 25' and 36" x 18' Dietrich & Harvey. Open side, M.D.

BORING MILLS

3½", 4", 5", 6" Horiz. Universal, Sellers, Ohio, Lucas, Niles, Defiance.
24" to 14' Vertical Bullard, Niles, Cincinnati, Betts, Colburn, etc.

MISCELLANEOUS

Gear Cutters
Bliss, Rafter, Ryerson, Hilles & Jones Rolls
Saws
Many other special machines
New 25 to 50 ton Hy. Testing Presses for Punching, Forging, Drawing, etc.

SHAPERS

7" to 32" Rhodes, Smith & Mills, Gould & Eberhardt, Stockbridge, Walcott, etc.

MILLERS

#2, #3, #4, #5, Plain and Universal, M.D., Cincinnati, Brown & Sharpe, Milwaukee, Hendey, Van Norman.
#2, #3, #4, #5, Vertical, M.D., Brown & Sharpe, Cincinnati, Bridgeport, Baker.
#08, Cincinnati, Vertical, M.D.
Brown & Sharpe, Cincinnati and Briggs Production, M.D.

AUTOMATICS

#00, #0, #2 Brown & Sharpe
2", 2½", 2¾" Cleveland, M.D.
Gridleys, Acmes, New Britains—latest models.

PUNCH & SHEARS

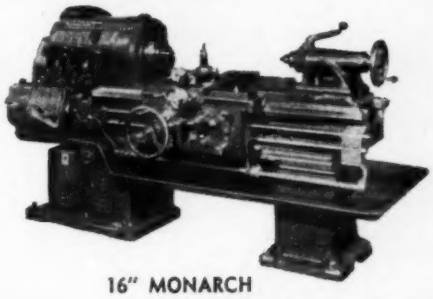
Cincinnati, Adlerhurst, Press Rite, Pels, Quickworth, etc.

GRINDERS

Cylindrical, Plain and Universal, Landis, Norton, Brown & Sharpe, Cincinnati.
Blanchard, Brown & Sharpe, Reid, Covel, Thompson, Sanford, Gallmeyer—Surface
#2, and #3 Cincinnati Centerless
Brown & Sharpe, Gallmeyer, Cincinnati—Universal Tool & Cutter
#70, #72A-5 Heald Internal, M.D.

HAMMERS, PRESSES AND OTHER FORGING EQUIPMENT

¼" to 8" Upsetters, Ajax, Waterbury
Hydraulic Presses, 60 to 3000 tons, Watson-Stillman, HPM, Farnham, Oil Gear Co., etc.
Mechnical Power Presses, up to 2000 tons, Ferracute, Toledo, Bliss, Waterbury, Z & H, V & O, Stiles & Parker Toggle Press about 350 ton 72" x 60" bed, 24-34" stroke.
#60¼ Toledo Power Press, 1200 ton
#57 Toledo Press, 100 ton, 75 ton Clearing



16" MONARCH

Complete plants for sale, such as toolroom, stamping, screw machines, etc.

S & S MACHINERY COMPANY
207 CENTRE STREET NEW YORK 13, N. Y.
MONA MEMBER

PUNCH PRESSES

IMMEDIATE DELIVERY FROM STOCK

No. 4½ BLISS, 80-100 Ton Capacity straight side punch press, late model with scrap cutters, double roll feeds, bolster. 15 Hp motors and controls, forced feed lubrication. 21x27 bolster, 4½" stroke, 14½" shut height. In both Single and Double Action Models. Like new, no welds or no cracks. (15 available for immediate delivery.)

No. 6 BLISS, 90-125 Ton Capacity, straight side Punch Presses, late model. With scrap cutters, roll double roll feeds, bolster, 15 Hp motors and controls, forced feed lubrication. 25x30" bolster, 5½" stroke, 16½" shut height. In both Single and Double action models. Like new. This machine is exactly like the above—only slightly larger model.

10—75 ton straight side punch presses adjustable strokes, late model, motorized.

SPOT WELDERS IMMEDIATE DELIVERY 5-100 KVA, Brand new. 5 year guarantee.

PAUL'S MOTOR AND MACHINERY SUPPLY CO.
MONA MEMBER
Detroit 8, Mich.
6111 Vermont Ave.
Tyler 76300

THREAD GAGES—PLUG AND RING

Slightly used, NF-2 & 3, ¼ to 1", 6, 8, 10 M.S. Also 1 to 4" N.S.
LESS 75 Percent Discount.
ADJUSTABLE SNAP GAGES. ALL SIZES. ½ to 8".
LESS 75 Percent Discount.

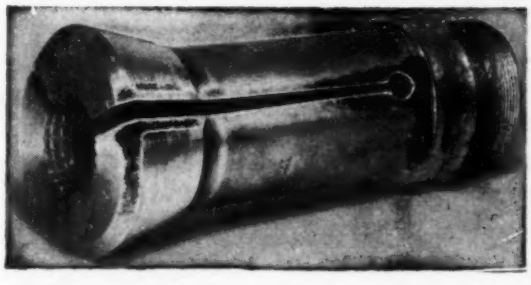
DE WITT TOOL COMPANY
173 GRAND STREET NEW YORK 13, N. Y.
Send For Our Bargain Circular

CUTOFF MACHINE

#425 CAMPBELL CUTALATOR WET ABRASIVE New in 1945. Four motor drive with AC motors. With tube cutting attachment.

J. L. LUCAS & SON, INC.
BRIDGEPORT 5, CONN. Tel. 9-3393

LARGE STOCK OF NEW & USED COLLETS



Also—Feed Fingers—Pads—Threading Equipment & Parts—Double Deck Tool Holders—Cams.
R. A. 6 Gridley Automatics—1¼", 1⅜", 1⅝", 2⅝".
Mod. 60 & 61 New Britain—Namco Die Heads.
Collets for Gridley Model F, ¾, ⅞", 1¼, 1⅜, 1¾, 2¼, 2⅝, Automatic Mach.
Extra large stock of 2⅝" R.A. 6 Gridley parts and collets.

We have a large stock of used collets and parts for Acme, 52, 53, 55 & 56, Acme Gridley, Cleveland, Cone, Foster, No. 4 and No. 6 Warner & Swasey, Bardons & Oliver, Brown & Sharpe, Garvin and New Britains.

GRAFF MACHINE TOOL COMPANY
7139 So. Halsted Street ***Vincennes 9664*** **Chicago 21, Ill.**

CLOSEOUTS

BORING MILLS
HORIZONTAL
2½", 4" Binsee

VERTICAL
66", 120" Niles
54" Colburn, M.D., 2 hds.

TURRET LATHES
Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36".
Acme 3¼" M.D.
No. 1L Gisholt Univ. M.D.

Hilles & Jones Straightening Rolls 6' wide by ½" cap. plate, M.D. with controls, practically new.

GRINDERS
P. & W. 14", 18", B.B., Vert. M.D.
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M. D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 2 Surface, M.D.
B. & S. No. 10 1 Cyl.
No. 2 Cincinnati Centerless, M.D.
B. & S. No. 1, 3 Universal
#25, G. & L. M.D.

LATHES
McCabe 26-42"x14'
26x12' Boye & Emmes 3 step cone, B.D.G.
14"x6', 16"x6' Hendey Grd. Hd.
9" LeBlond Automatic
36x30' Putnam M|D.
36x22" Putnam, S.C.G., D.C. M.D.
32"x26' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS
B. & S. No. 2, Hand Screw
B. & S. No. 0
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
P & J 6A, M.D.
⅞" Cone 4 spindle

New In Stock
5, 10, 18 ton OBI Power Presses
7" Ammco Shapers
H.S. Vertical Milling Heads, Drill Presses, Foot Presses
Kalamazoo Metal Band Saws

RADIALS
4', 5', 6' American Triple Purpose
4', 5' Cincinnati-Bickford
4' Mueller, M.D.; 4' 5' Western, S.P.D.
4' American Hole Wizard

MILLING MACHINES
Cincinnati, #2 Univ.
No. 3S Cincinnati, S.P.D. rapid trav. M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
K. & T., B. & S., No. 2, 3 like new
B. & S. No. 2, 3, Vert.
Kempsmith No. 1 Univ.
No. 8½D Gorton Vertical, M.D.
#3 Van Norman Universal
#2 Conradson Universal

MISCELLANEOUS
Gorton No. 1S, 3U Engraving Machine
6 spindle Avey Drill, 15" overhang
Rochester No. 5½" B Hammer
6" Vertical Shaper, P & W
Oster Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
No. 8 Marvel Band Saw, M.D.

AARON MACHINERY CO., INC.
45 Crosby St.
New York 12, N. Y.

Buy from the Man Who Knows How to Run Them

AUTOMATIC SCREW MACHINES

National Acme Gridley—New Britain Gridley—Conomatic

Lowest Prices

Country's Largest Automatic Dealer

Large listing of Lathes, Planers, Shapers, Millers, Boring Mills, Drills, Welders, etc.

THIS WEEK'S SPECIALS:

One 2¼" Model 61 New Britain Gridley Automatic Screw Machine, new in 1942, $5995.00
One 1⅝" RA4 National Acme Automatic Screw Machine, new in 1941
One 1⅜" RA4 National Acme Automatic Screw Machine, new in 1941
One 2" National Acme Automatic Screw Machine, 1941, $4975.00
One 1⅝" RA6 National Acme Automatic Screw Machine, 1941, $4400.00
One 3½" National Acme Automatic Screw Machine, new in 1942, motor, conveyor, threading spindle, $8995.00

Before Buying, Selling or Trading, see

R. V. OSMUN COMPANY

406 Bloomfield Ave., Bloomfield, N. J. **Blfd 2-7640**

LIQUIDATIONS ***APPRAISALS***

DRILLS
28" Cincinnati Bickford, Sliding Head
32" Cincinnati Bickford, Sliding Head
6' American, Radial
4' Fosdick, Radial

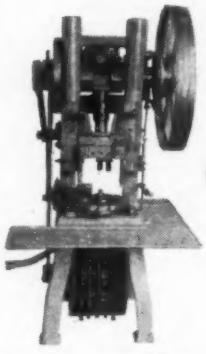
GRINDERS
#2 Reid
#33 Abrasive
Model B Thompson, Hydraulic
#2 Cincinnati Centerless

LATHES
14" x 6' Hendey, Tie Bar
15" x 6' Sidney
16" x 6' Porter-McLeod
16" x 7' Lehman Hydratrol
17" x 6' LeBlonde, Taper Attachment
19" x 8' Sidney
31" x 21' American, Geared Head

MILLERS
#2 S.P. Van Norman, Plain
#2 Cincinnati, Vertical, Dial Type
#3 Cincinnati, Plain
#4 Cincinnati, Universal

TURRETS
#5 Gisholt, Universal
#3B Foster, Universal

DELTA EQUIPMENT CO.
148 N. 3d St. **Phila. 6, Pa.**



WATERBURY FARREL TYPE OPEN BACK PRESS ON LEGS

•

13" dia., stroke 8". Flywheel 36 x 4¼", light type. Die space 9¼", area of bed 10" x 18¾", bed to ways 9¼", dial type; has knockout arrangement underneath.

J. L. LUCAS & SON, INC.
BRIDGEPORT 5, CONN. Tel. 9-3393

FOR SALE

PRODUCTION LATHES

Excellent Condition

3—#3 Lodge & Shipley Duomatic Engine Lathes—$650.00 Each

WINSTON MACHINERY CO., INC.
517 South Delaware Street
Indianapolis, Ind. **FR. 1469**

FOR SALE

Do-All Saw Model V-36
Gould & Eberhardt Shaper 20"
Fellows Gear Shaper #6A
Heald D.E. Goremetic #46

MILLING MACHINES
Brown & Sharpe #12 Prod. Mill
Ohio Production
Milwaukee Vertical
Kempsmith Vertical

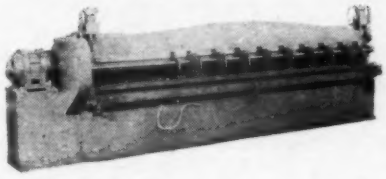
GRINDERS
Heald 60, 65
Landis Cylindrical
P & W Surface

Other Quality Machine Tools

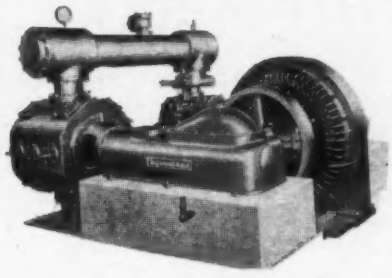
THE VIMALERT COMPANY, LTD.
807 Garfield Ave., Jersey City 5, N.J.

LATEST TYPE and DESIGN—EXCELLENT CONDITION

for Immediate Shipment



YODER Multiple Rotary Tube Cut-off Machine. Minimum diameter tubes 1"—Maximum 3½". Minimum wall thickness ⅛"—maximum, 12". Minimum distance between centers 6". Equipped with motor, eight 5" disc type cutter heads, automatic kickout for cut tubes.



INGERSOLL RAND Type XRB Air Compressor, Duplex heavy duty, direct connected synchronous motor driven, equipped with 200 HP 3 phase 60 cycle, 2300/300 type TS frame, 6304-D General Electric Motor DC generator with starting equipment—after cooler and 1500 cu. ft. receiver. Rated size L.H. 12"x12", R.H. 19½" x 12". Maximum capacity rated at 1058 cu. ft. per min. Maximum RPM—300.

ACT QUICKLY:
WIRE,
PHONE OR WRITE

MOREY MACHINERY CO., INC.

410 BROOME STREET **NEW YORK, N. Y.**

Telephone No. CAnal 6-5360

McDONALD
USED MACHINERY

G & E 16" & 24" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
American 4' Radial Drill, encl. hd.
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Barnes geared Camelback Drill Press, 4 sp.
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. #3-A
L & S 18x12' & 20'x10' 20"x8' Grd. Hd. M.D. & 16"x6' Lathes
American 24'x12' grd. hd. lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck.
Cincinnati #2 Centerless Grinder.
Colburn 60" Vert. Boring Mill
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No 3-B Vert. Miller grd. hd., m.d.
Cin-Bick 3' Super Serv. Radial
Cincinnati 48" Auto Pl. Prod. Miller, S.P.D.
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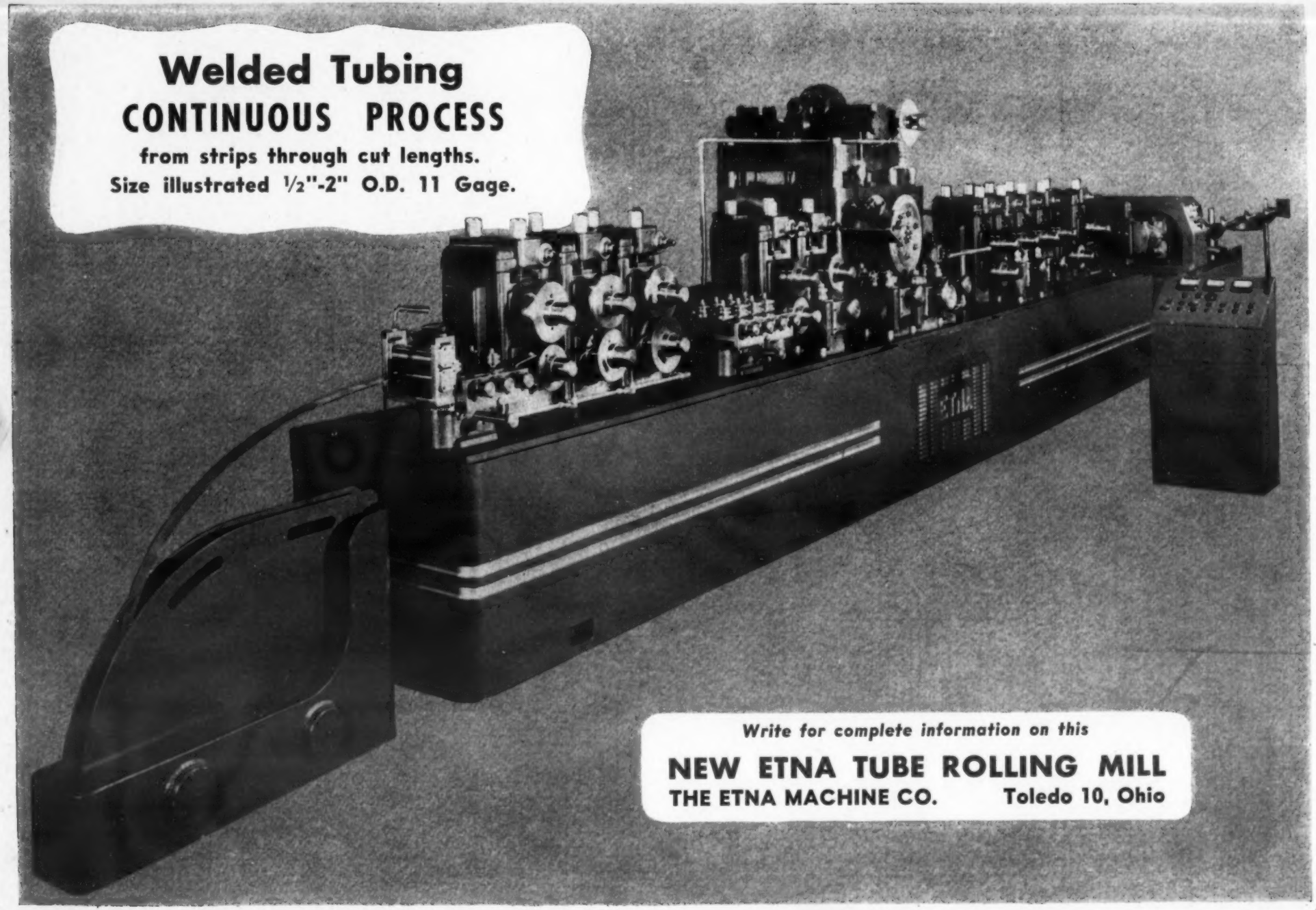
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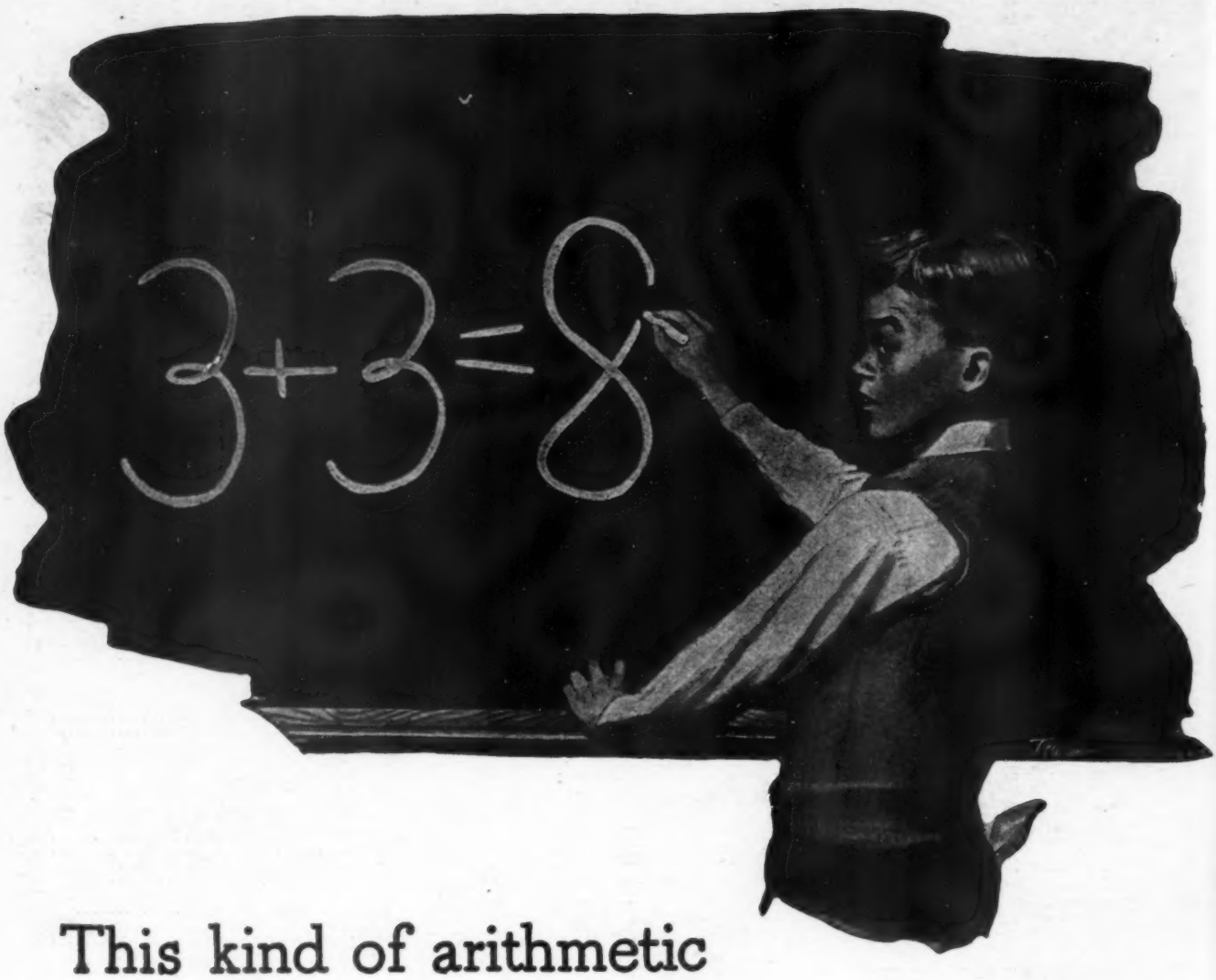

This kind of arithmetic may put Johnny through college

Here's how it works out:

$3 put into U. S. Savings Bonds today will bring back $4 in 10 years.

Another $3 will bring back another $4.

So it's quite right to figure that 3 plus 3 equals 8 . . . or 30 plus 30 equals 80 . . . or 300 plus 300 equals 800!

It will . . . in U. S. Savings Bonds. And those bonds may very well be the means of helping you educate your children as you'd like to have them educated.

So keep on buying Savings Bonds—available at banks and post offices. Or the way that millions have found easiest and surest—through Payroll Savings. Hold on to all you've bought.

You'll be mighty glad you did . . . 10 years from now!

SAVE THE EASY WAY... BUY YOUR BONDS THROUGH PAYROLL SAVINGS

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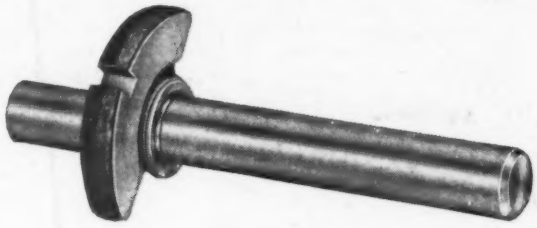
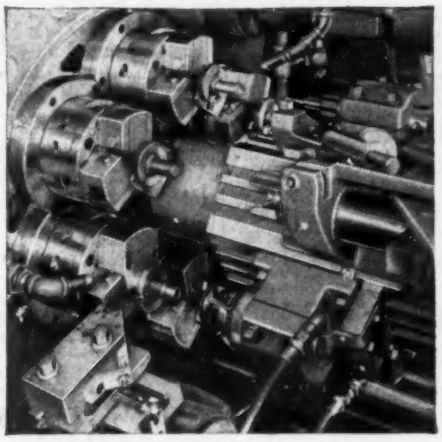
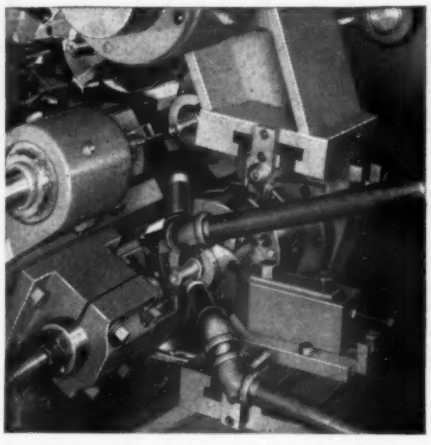
LEADERSHIP BASED ON ACCOMPLISHED FACTS



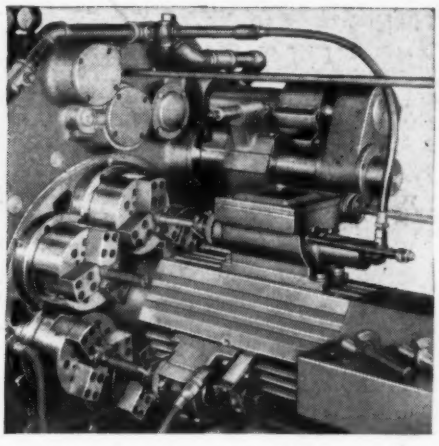
...A CASE OF MATCHED PRODUCTION



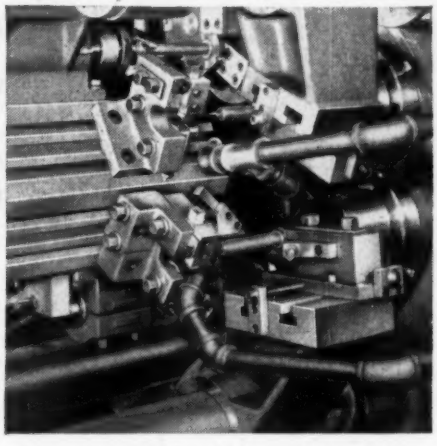
Front view first operation . . . Entirely open end construction provides accessibility for simplified chucking, cutting tool and attachment setup.



Rear view first operation . . . Wide open end construction provides extra large chip space...accessibility from three sides and from above that permits excellent visibility and easy tool adjustment.



Front view second operation . . . Note accessibility to tools through entirely open end construction.

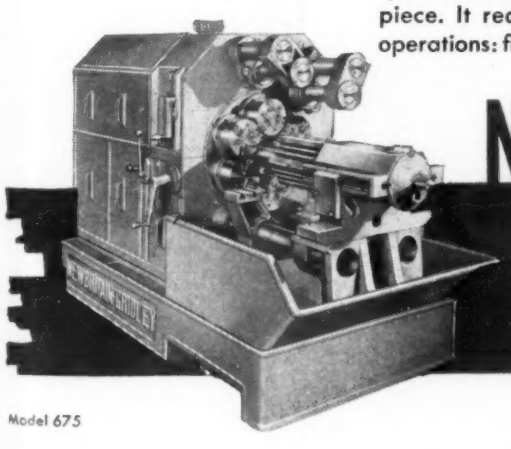


Rear view second operation . . . Note relationship of cross arms to tool slide permitting more efficient tool layout and high production.

The acknowledged versatility and adaptability of New Britain Multiple Spindle Automatic Chuckers is of major importance to buyers. Of equal value is the long practical experience of our engineering department in putting the capabilities of our machines to full use.

Two New Britain Model 675 Six Spindle Automatic Chucking Machines were tooled for the *matched* production of the forged steel crankshaft illustrated . . . with a consequent minimum cost per piece. It required two operations: first, to finish the short eccentric end, while the second machined the long end. These two high production New Britain Automatics produced 133 pieces per hour. The counterweight is faced on both sides during the first operation, enabling the second machine to operate at higher spindle speeds for the machining of the longer end.

Before you decide that you already enjoy top efficiency in machining any piece . . . or before you conclude that "it can't be done on an automatic", let us examine the blueprints and specifications of the job. Call our sales engineer in your territory, or write The New Britain Machine Company.



Model 675

NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY

NEW BRITAIN, CONNECTICUT

NEW BRITAIN-GRIDLEY MACHINE DIVISION

M-01039

America's Leading Source of 52100

High Carbon-Chrome Steel

. . . for these good reasons:

The Timken Roller Bearing Company through its Steel and Tube Division:

—pioneered the production of 52100 tubing.

—is the world's largest producer of 52100 tubing.

—is the only source of 52100 steel in the three finished forms; tubes, bars and wire.

—has direct control of quality from melting to final inspection.

—has the world's largest battery of controlled atmosphere furnaces for annealing 52100 steel — thus assuring minimum decarburization and maximum machinability.

—has consistently led the industry in the development and application of 52100 steel for those machined parts where an oil hardening steel of good wear resistance is required.

These advantages coupled with a thorough-going Job Analysis Plan and follow-through to final use in customers' plants, assures your complete satisfaction. Write or phone Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

ONLY TIMKEN MAKES ALL THREE PRODUCTS

52100 forging bars and billets in a complete range of sizes. Machining bars in hot rolled annealed, cold drawn, turned or centerless ground finish.

52100 tubing from 1" O.D. to 10" O.D. in a wide range of wall thicknesses, and in hot rolled annealed, cold drawn, turned, centerless ground and Roto-rolled finishes.

A mill warehouse stock of 99 popular sizes is available for immediate shipment.

52100 wire in coils in sizes up to ¾" round, hot rolled, hot rolled annealed, and cold drawn for hot and cold heading applications and other uses where coil stock is suitable.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

Fine Alloy

STEEL AND SEAMLESS TUBES

YEARS AHEAD — THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS in hot rolled and cold finished Alloy Steels for forging and machining applications, as well as a complete range of Stainless, Graphitic and Standard Tool Steel analyses. Also Alloy and Stainless Seamless Steel Tubing for mechanical and pressure tube applications.